

MMPI-A PROFILES OF ADOLESCENTS
AT ADMISSION TO RESIDENTIAL
SUBSTANCE ABUSE
TREATMENT

Lora L. Passetti

174 Pages

May 2002

This research attempts to extend the work of Massy, Walfish, and Krone (1992) by cluster analyzing the MMPI-A profiles of adolescents in residential substance abuse treatment and describing clusters in greater detail.

APPROVED:

Date Michael J. Stevens, Chair

Date James J. Johnson

MMPI-A PROFILES OF ADOLESCENTS
AT ADMISSION TO RESIDENTIAL
SUBSTANCE ABUSE
TREATMENT

Lora L. Passetti

174 Pages

May 2002

Adolescents entering residential substance abuse treatment present with a wide assortment of personalities and a myriad of difficulties ranging from school, behavior, and legal concerns to abuse issues and psychiatric co-morbidity. One cluster analytic study addressing adolescent substance abusers in residential treatment was conducted by Massey, Walfish, and Krone in 1992. Using the original MMPI (intended for adult use) with old adolescent norms, they identified three clusters of clients. To determine if Massey et al.'s 1992 results extend to the adolescent version of the MMPI and across agency settings, the goal of this research was to perform a cluster analysis on the MMPI-A profiles of 100 adolescents at admission to residential substance abuse treatment and describe the resultant clusters in more detail.

Analyses resulted in an empirically derived four cluster solution. Cluster 1 consisted of individuals who may have presented themselves in a positive light and may have suffered from a wide array of clinically significant mental health and behavioral

problems but were significantly lower in severity than Cluster 3. Cluster 2 profiles indicated that they may have experienced clinically significant levels of mental health, behavioral, and environmental issues. The severity of Cluster 2's symptoms were significantly lower than Cluster 3's. Cluster 3 exhibited the greatest breadth and intensity of emotional distress, behavioral problems, and environmental problems. Cluster 4 was described as impulsive with an acting out personality style. Cluster 4 individuals also demonstrated internal mental distress of great breadth and suffered from depression. In summary, all clusters appeared to have problems in multiple areas of their lives. The biggest difference between clusters appeared related to the severity of these problems.

This research raises questions about the validity and reliability of the four clusters and whether or not this study is a true extension of Massey et al.'s 1992 work. These limitations reinforce why it is necessary to integrate MMPI-A and Global Appraisal of Individual Needs (GAIN) information with other test results, clinical interviews, family assessment, and a psychosocial history for diagnostic and treatment planning recommendations.

APPROVED:

Date Michael J. Stevens, Chair

Date James J. Johnson

MMPI-A PROFILES OF ADOLESCENTS
AT ADMISSION TO RESIDENTIAL
SUBSTANCE ABUSE
TREATMENT

LORA L. PASSETTI

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

Department of Psychology

ILLINOIS STATE UNIVERSITY

2002

THESIS APPROVED:

Date Michael J. Stevens, Chair

Date James J. Johnson

ACKNOWLEDGMENTS

The writer wishes to thank Dr. Stevens and Dr. Johnson for their guidance, time, and quick feedback. Thanks also to Loree Adams and Mark Godley for their support and permission to access data collected as part of the Assertive Aftercare Program (AAP) study, to Mike Dennis for his encouragement and advice, to Susan Godley for her support in keeping the motivation going, and to Matt Orndorff, Laura Slown, and Jennifer White for their valuable contributions to the AAP project, and therefore, this research. Finally, a special thanks to Rod Funk for spending his personal time as a statistics consultant.

L. L. P.

CONTENTS

	Page
ACKNOWLEDGMENTS	i
CONTENTS	ii
TABLES	v
FIGURES	vi
CHAPTER	
I. INTRODUCTION	1
II. REVIEW OF THE LITERATURE	7
Complexity of Adolescent Substance Abuse	7
Assessment of Adolescent Substance Abuse	9
Identifying Subgroups of Adolescent Substance Abusers	10
Adult Subgroups Based on Original Version MMPI Profiles	12
Adolescent Subgroups Based on MMPI-A Profiles	16
Research Goals	19
III. METHODOLOGY	21
Description of the Sample	21
Assessments	24
Minnesota Multiphasic Personality Inventory - Adolescent (MMPI-A)	24
Global Assessment of Individual Needs (GAIN)	26

Collection of the Data	30
Clinical and Research Record Extraction	30
Adherence to Ethical Requirements	32
Analyses	33
Hypotheses	34
IV. RESULTS	36
Comparison of Male and Female Profiles	36
Cluster Identification	36
Cluster Validation	39
Cluster 1	45
Cluster 2	46
Cluster 3	47
Cluster 4	48
V. DISCUSSION	50
Possible Descriptors and Clinical Applications	50
Cluster 1	50
Cluster 2	51
Cluster 3	53
Cluster 4	55
Evaluation of Research Goals	58
Evaluation of Hypotheses Regarding Cluster Formation	59
Evaluation of Cluster Validation Hypotheses	61
Integrated Description of Four Clusters	62
Comparison of Four Clusters to Massey et al. (1992)	
Clusters	63
Study Limitations	65
Summary	67
Suggestions for Further Research	69
REFERENCES	71
APPENDIX A: GAIN	83

APPENDIX B: Clinical Director Permission Form	171
APPENDIX C: Chestnut Health Systems Permission Letter	173

TABLES

Table		Page
1.	Mean MMPI-A Scale T-Scores and Standard Deviations by Cluster	38
2.	Mean GAIN Scale Scores and Standard Deviations by Cluster	40
3.	Tests for Between-Subjects Effects of GAIN Indices	43
4.	Trends and Significant Differences Between Clusters on Validation Variables	44
5.	Comparison of Clinical Severity by Cluster Across MMPI-A and GAIN Scale Scores	56
6.	Comparison of Clusters Across Demographic and Clinical Record Variable	57
7.	Chi-Square Results of Differences Approaching Significance Between Clusters on Frequency of Diagnoses	58
8.	Possible Clinical Descriptors of Clusters Based on MMPI-A and GAIN Scale Scores	64

FIGURES

Figure		Page
1.	MMPI-A Profiles of Four Clusters	39
2.	MMPI-A Profile of Cluster 1	45
3.	MMPI-A Profile of Cluster 2	46
4.	MMPI-A Profile of Cluster 3	48
5.	MMPI-A Profile of Cluster 4	49

CHAPTER I

INTRODUCTION

Substance abuse and its related problems affect youth across the nation.

Adolescents are using substances at younger ages than ever before and are entering treatment at increasing rates. This influx of young clients helps spur treatment agencies to identify and implement the most effective and cost-effective treatment strategies. Additionally, agencies wind up treating a host of other non-substance abuse problems which demand intervention, ranging from school, behavior, mood, and legal concerns to abuse, family, and peer issues. Thorough, accurate assessments of these issues at intake to treatment is highly important for treatment planning since multiple difficulties tend to be the rule with these adolescents rather than the exception.

Historically, many instruments that have been used to assess adolescents have been unstandardized, locally developed, or adult measures. The addiction process in adolescents is an area under investigation, implying that adolescent substance abusers are not necessarily similar to adult substance abusers. Since no single treatment is effective with every client, a focus on co-morbid problems may have other important treatment implications. Identifiable subgroups of substance abusing adolescents may help clinicians respond to each subgroup with specialized treatment strategies.

One method of creating “clusters” of substance abusing adolescents is to group them according to personality variables and types of psychopathology. Such research has been aimed mostly at adult male alcoholics and has resulted in multiple classification systems developed by various researchers. One cluster analytic study conducted with adolescent substance abusers in residential treatment has been identified. Massey, Walfish, and Krone (1992) performed a study using the original version of the Minnesota Multiphasic Personality Inventory (MMPI; Archer 1997b) with old adolescent norms and identified three distinct clusters of clients: (a) one subgroup of 41 clients (16%) exhibiting high levels of broad psychopathology; (b) another subgroup of 97 clients (39%) revealing an impulsive, acting-out style of personality; and (c) a final subgroup of 112 clients (45%) showing a lack of any clinically significant elevations.

Although the MMPI has been a clinical assessment tool used widely with adolescents, several significant issues surround its use with this population. Since it was not designed for adolescents, the language, item content, and reading level are geared toward adults. Which norms to use when scoring and interpreting adolescent profiles (adult, K-corrected, or adolescent) has been highly debated. Studies in this area pointed toward the need to develop an adolescent version of the MMPI.

The MMPI Restandardization Project Committee was created in 1989 and subsequently developed two new versions to replace the original MMPI: the Minnesota Multiphasic Personality Inventory-2 (MMPI-2; Butcher et al., 1989), an adult version with new adult norms, and the Minnesota Multiphasic Personality Inventory - Adolescent (MMPI-A; Butcher et al., 1992), an adolescent version with nationally representative

adolescent norms. Once the MMPI-A was released, research was needed to assess the generalizability of adolescent literature on the original MMPI to the new adolescent version.

The purpose of this research was to determine if Massey et al.'s 1992 results extend across MMPI test versions and across agency settings by performing a cluster analysis on MMPI-A profiles of adolescents admitted to residential substance abuse treatment at Chestnut Health Systems in Bloomington, Illinois. The second goal of this research was to attempt to describe identified clusters in detail to provide a better picture of the complexity inherent in adolescent substance abusers. By contributing to the body of knowledge regarding subtypes of adolescent substance abusers, clinicians may have a clearer idea of which types of clients produce particular MMPI-A profiles and the likely characteristics, histories, and problems which occur with them. This information could aid in the formulation of interventions, client retention, and the individualization of treatment planning.

Since both samples consisted of adolescent substance abusers in residential treatment, it was predicted that the clusters of MMPI-A profiles identified in this study would resemble the ones found by Massey et al. (1992): (a) a subgroup exhibiting high levels of broad psychopathology; (b) a subgroup revealing an impulsive, acting-out style of personality; and (c) a final subgroup showing a lack of clinically significant elevations. These three groups have been identified as well in several studies of adult male alcoholics (Blashfield, 1985; Graham & Strenger, 1988; Morey & Blashfield, 1981; Nerviano & Gross, 1983).

In earlier research, different typologies of substance users displayed different patterns of substance-related and mental health-related problems (Babor et al. 1992b; Kline & Snyder, 1984; Morey, Skinner, & Blashfield, 1984; Schuckit, 1985). Data from the Global Assessment of Individual Needs (GAIN; Dennis, 1991), the biopsychosocial clinical assessment of Chestnut Health Systems, contain the following substance and mental health indicators chosen to be examined for cluster differences in this study: (a) substance use problems and substance use frequency as measured by the Substance Problem Index and Substance Frequency Index; (b) symptoms of depression, anxiety, traumatic stress, attention deficit disorder, conduct disorder, and general mental distress as measured by the Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, and General Mental Distress Index; (c) treatment motivation, treatment resistance, and perceived self-efficacy to abstain from substances as measured by the Treatment Motivation Index, Treatment Resistance Index, and Self-Efficacy Index; (d) risk in the living, vocational, social, and general environment as measured by the Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, and Environmental Risk Index; (e) general victimization as measured by the General Victimization Index; and (f) sources of stress, level of general social support, and engagement in illegal activity as measured by the Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index.

It was predicted that scores on the Substance Problem Index, Substance Frequency

Index, Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, and the General Mental Distress Index would distinguish MMPI-A profile clusters from one another. These indices appeared to reflect the substance abuse symptoms and psychopathology which discriminated between the three common profiles already described. No prediction was made regarding the Treatment Motivation Index, Treatment Resistance Index, Self-Efficacy Index, Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, Environmental Risk Index, General Victimization Index, Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index since these indices were meant for an exploratory analysis in identifying cluster-distinguishing variables not included in other research.

In the following description of this study, the first chapter presents an overview of the complex nature of adolescent substance abuse. Chapter 2 describes the current state of adolescent substance abuse assessment and then illustrates the value of identifying subgroups of substance abusers. Research in this area conducted with adults, and with the MMPI in particular, is reviewed. Adolescent subgroups based on MMPI-A profiles are then discussed, and the research goals are defined.

Chapter 3 contains a description of the sample to be used for this research. After reviewing the assessment tools, data collection procedures, and planned analyses, this chapter ends with a description of the hypotheses for this study. Chapter 4 presents the results of the analyses, while Chapter 5 closes with a discussion, limitations of the study,

summary, and suggestions for further research.

CHAPTER II

REVIEW OF THE LITERATURE

Complexity of Adolescent Substance Abuse

Substance use and abuse among adolescents is a national concern, affecting youth from every socioeconomic class, ethnic background, and location. Alarming, adolescents report that gaining access to substances is surprisingly easy. They assert that buying cigarettes is tougher than obtaining marijuana, and more than 60% of teens in high school during the year 2000 stated that drugs were used, kept, or sold at their school (Substance Abuse and Mental Health Services Administration, 2001). According to preliminary results from the National Household Survey on Drug Abuse, the rates of substance use among adolescents may be leveling off; however, the “estimated rates of youth initiation of marijuana and other drugs [is] at historically high levels” (Substance Abuse and Mental Health Services Administration, 1997, p. 6) and is 50-100% higher than in 1992 (Johnston, O’Malley, & Bachman, 2000).

While alcohol, marijuana, and cocaine are the most typical substances abused by adolescents (Babor, Del Boca, McLaney, Jacobi, Higgins-Biddle, & Hass, 1991), Illinois youth are more likely to use tobacco, marijuana, and LSD when compared to similar youth across the country. Illinois adolescents report a concurrent decline in the perceived

harm from using these substances and an increase of usage in lower grade levels, especially by eighth grade students (Department of Alcoholism and Substance Abuse, 1995). Corresponding to the statewide and national high rates of substance usage, the number of adolescents entering treatment has increased 53% between 1992 and 1998 (Johnston et al., 2000). This trend will most likely increase pressure on substance abuse treatment systems to provide the most effective and cost effective services to a population with a multitude of problems (Substance Abuse and Mental Health Services Administration, 1997).

When they enter treatment, adolescent substance abusers exhibit varying degrees of problems related to the consequences, context, and severity of their use (Leccese & Waldron, 1994), frequently presenting with a myriad of difficulties which complicate treatment and require intervention. Treatment providers are expected to address problems ranging from school, behavior, mood, and legal concerns to abuse, family, and peer issues (Babor et al., 1991; Barnes, 1984; Bukstein, Brent, & Kaminer, 1989; Dennis, Godley, & Titus, 1999; Dielman, Butchart, Shope, & Miller, 1991; Donovan, Jessor, & Costa, 1988; Farrell, Danish, & Howard, 1992; Komro et al., 1999; Moss & Kirisci, 1995; Shedler & Block, 1990; Tarter, Kirisci, Hegedus, Mezzich, & Vanyukov, 1994). Psychiatric conditions such as conduct, attention-deficit/hyperactivity, eating, anxiety, and depressive disorders (Bukstein et al., 1989; Clark, Jacob, & Mezzich, 1994; DeMilio, 1989; Hammersley, Lavelle, & Forsyth, 1992; Neighbors, Kempton, & Forehand, 1992) commonly compound the situation. One question facing substance abuse treatment agencies is how best to assess and help this diverse group of adolescents.

Assessment of Adolescent Substance Abuse

Clearly, adolescent substance abuse is a problem embedded in a complex network of problem behaviors, environments, and relationships which warrants a multidimensional evaluation when clients are admitted to treatment (Babor et al., 1991; Risberg, Stevens, & Graybill, 1995; Winters 1990a, 1990b). Since treatment is typically tailored to the nature, severity, and extent of problems, there is a need for those clinicians treating substance abusing adolescents to have access to assessment instruments designed specifically for youth (Leccese & Waldron, 1994). Effective objective assessments are critical for clinicians to target specific problem areas reliably and systematically as well as to individualize treatment planning (Finney & Moos, 1986; Risberg et al., 1995). Since many instruments used to evaluate adolescent substance abuse are still in their developmental stages (Leccese & Waldron, 1994), treatment agencies often utilize unstandardized, locally developed, or adult measures to assess youth drug and alcohol problems (Owen & Nyberg, 1983; Winters, 1990a, 1990b).

A contributing factor to the paucity of assessment instruments designed specifically for adolescent populations is the fact that most substance abuse investigations have focused on adult samples with adult measures and adult norms (Risberg et al., 1995; Winters, 1990b). A lack of scientific knowledge exists about the addiction process in adolescents (Winters, 1990a, 1990b). Diagnoses are described in terms of the adult disorder without empirical justification, and current criteria are often inadequate in describing clinically relevant patterns of substance abuse in adolescents. For example, adolescents rarely present with significant withdrawal symptoms (Bukstein & Kaminer,

1994; Martin, Kaczynski, Maisto, Bukstein, & Moss, 1995; Winters, Stinchfield, Fulkerson, & Henly, 1993) and display different usage patterns than adults. Continued use despite psychological problems is more common than use despite medical problems (Martin et al., 1995), and many symptoms of abuse and dependence spontaneously remit without following a progressive course into adulthood (Bukstein & Kaminer, 1994). In short, adolescents are commonly assessed and treated according to adult standards.

Identifying Subgroups of Adolescent Substance Abusers

No single treatment has proven itself consistently effective for all individuals with drug or alcohol concerns or has reflected the complex nature of the issue (Finney & Moos, 1986). For this reason, co-occurring problems have important treatment implications since they may yield identifiable subgroups of substance abusing adolescents who will require and respond to specialized treatment strategies (Graham & Strenger, 1988; Windle, 1996). Some research has shown that treatment effectiveness can be improved by matching types of clients to the most appropriate programs (Kadden, Cooney, Getter, & Litt, 1989; Litt, Babor, Del Boca, Kadden, & Cooney, 1992; McLellan, Woody, Luborsky, O'Brien, & Druley, 1983; Project MATCH, 1993; Rohsenow et al., 1991). Proposed benefits of treatment matching include client retention, individualized treatment within a program for different needs, and increased positive outcomes such as reduced relapse rates and decreased use (Finney & Moos, 1986; Litt et al., 1992).

One method of assigning clients to the most appropriate interventions is based on the assessment of personality variables (Finney & Moos, 1986). According to Bukstein and Kaminer (1994), the use of typologies to define subgroups of adolescent substance

abusers based on personality traits and co-existing psychopathology provides the most promise in establishing a valid diagnostic system. Likewise, Shedler and Block (1990) stated that problematic adolescent drug usage is best understood in the context of an individual's personality structure and developmental history. The presence or absence of certain personality traits such as sensation-seeking tendencies (Brook, Whiteman, & Gordon, 1983; Hobfoll & Segal, 1983; Zuckerman, 1972), low harm avoidance, low achievement and high affiliation, autonomy, exhibition, and impulsivity (Labouvie & McGee, 1986) have been linked to adolescent substance use by researchers.

For adults, research aimed at defining subtypes of substance users has resulted in the development of several classification systems which group individuals according to different variables. Babor et al. (1992b) empirically analyzed data from adult male and female alcoholics and identified Type A and Type B subgroups. Type A alcoholics presented with a later onset of drinking problems, less severe dependence, and less psychological dysfunction. Type B alcoholics' onset of alcohol related problems emerged earlier, and they displayed a greater severity of dependence and psychopathology.

In 1985, Schuckit described four distinct subgroups of adult men entering alcohol treatment at a veterans hospital. Group 1, "primary alcoholics" much like Babor et al. (1992b)'s Type A, were older with a later onset of alcoholism, lower intensity of drinking, and fewer antisocial problems. A second group consisted of primary drug abusers with secondary alcoholism. More legal and social problems were associated with this subtype than the first. Members of a third group were diagnosed with primary antisocial personality disorder and secondary alcoholism. Like Group 2 individuals, more

legal and social problems occurred than in Group 1. The fourth group's members were diagnosed with a primary affective disorder and secondary alcoholism. Their histories contained more past suicide attempts and psychiatric care and a lower intensity of drinking than the other groups.

Results from another study conducted by Morey et al. (1984) yielded and replicated three distinct types of adult drinkers. Type A individuals were early stage problem drinkers, while Type B members were described as affiliative with a moderate dependence on alcohol. The Type C subgroup tended to be schizoid with severe alcohol dependence.

Adult Subgroups Based on Original Version MMPI Profiles

Grouping substance abusing clients by their profiles from the original version of the Minnesota Multiphasic Personality Inventory (MMPI; Archer, 1997b), hereafter referred to as the MMPI, has been a popular method of attempting to match smaller groups of individuals to more appropriate treatment interventions. Several MMPI studies have used cluster analytic techniques as one way of identifying "clusters" of homogenous people within a data set who differ on the profiles they produce as well as combinations of other important variables (e.g., gender and criminal justice involvement) (Borgen & Barnett, 1987; Rapkin & Luke, 1993). Clusters are then investigated for how well they predict various treatment-related variables such as response to treatment, length of stay, discharge status, and post-treatment functioning. Most prior research in this area has focused on adult, male alcoholics.

In 1981, Conley categorized the MMPI profiles of male alcoholics into four

groups: (a) “neurotic” with scales 1 (*Hs*: Hypochondriasis), 2 (*D*: Depression), 3 (*Hy*: Hysteria), and 7 (*Pt*: Psychasthenia) all with T-scores greater than 60 and a secondary elevation on scale 2; (b) “classic” with scales 2, 4 (*Pd*: Psychopathic Deviate), and 7 all above a T-score of 60 and secondary elevations on scales 8 (*Sc*: Schizophrenia) and 2; (c) “psychotic” with the highest elevation on scale 8, the second highest elevation on scale 6 (*Pa*: Paranoid), 7, or 9 (*Ma*: Hypomania) and lower elevations on scales 2 and 4; and (d) “psychopathic” with scales 4 and 9 above a T-score of 60.

Kline and Snyder (1984) analyzed MMPI profile clusters of adult inpatients. A three cluster solution maintained clinical distinctiveness and was adopted. Type 1 individuals’ profiles displayed marked psychopathology with significant elevations on at least five clinical scales. Profiles of the second type demonstrated psychopathy. Type 3 profiles were within normal limits, with subclinical elevations on scales 4 and 9. These results are consistent with groups identified in other MMPI alcoholic typological investigations.

Also in 1984, Pfost, Kuncze, and Stevens described three prototypical MMPI profiles produced by 38 white males receiving alcoholism treatment in a veterans hospital. Type 1 profiles were characterized by elevations on scales 1 and 2. Type 2 profiles contained elevations on scales F (Infrequency), K (Defensiveness), 4, and 9, and Type 3 profiles displayed elevations on scales K, 3, and 4.

Four separate studies have attempted to summarize this wealth of MMPI literature on subtypes of adult alcoholics. Morey and Blashfield (1981) reviewed research to search for common MMPI profiles. Most cluster analyses used male veterans or state hospital

patients with an average age of 45 years. All but one out of 15 studies examined found a cluster with a high scale 4 profile, noted by some researchers to be long term, moderately heavy users of alcohol. Another cluster established in all but three studies is one with a 2-7-8 codetype. They were the heaviest users of alcohol, the most likely to experience withdrawal, and generally showed the most severe psychopathology.

A meta-cluster analysis on cluster centroids found in 11 previous MMPI studies of alcoholics (mostly inpatient males in VA hospitals) was performed by Blashfield in 1985. Results were a two cluster solution: one with a relatively low profile with peaks on scales 4 and 2 and a second with peaks on scales 8, 2, and 7.

Six MMPI profile clusters of adult alcoholics were identified by Graham and Strenger (1988). The MMPI profile of the first type yielded a primary elevation on scale 4 and a secondary elevation on scale 2 in the absence of other significant elevations. The second type's primary elevations were on scales 2, 7, and 8 with a secondary elevation on scale 4. The third type was defined by a primary elevation on scale 4 and a secondary elevation on scale 2 and/or 9. A fourth type was characterized by elevations on scales 4 and 9 with the absence of other significant elevations. Primary elevations on scales 1, 2, and 3, sometimes with a secondary elevation on scale 4, describe the fifth type, while the sixth type displays T-scores between 80 and 100 on scales 8 and F, with other elevations greater than T-scores of 70-100.

Nerviano and Gross (1983) also summarized apparent consistencies in the literature. They described seven adult alcoholic personality prototypes from their research: (a) a 2-7-8 codetype characterized by chronic, severe distress and the most

substantial elevations on scales 2, 7, 8, and 4; (b) a passive-aggressive and sociopathic personality with a primary scale 4 elevation and a secondary scale 2 elevation; (c) an antisocial-sociopathic personality with primary elevations on scales 4 and 9; (d) a personality with reactive-acute depression and a primary elevation on scale 2 with a secondary elevation on scale 4; (e) a severely neurotic-psychophysiological personality with relatively high elevations on scales 1, 2, 3, and 4; (f) a mixed character-dysphoric personality with elevations on scales 2, 4, and 7; and (g) a paranoid-alienated personality with elevations on scales 8, 4, 7, 2, 6, and 9. According to Nerviano and Gross, almost all of the problems associated with alcoholics in the literature are represented by these subtypes. The different clusters of traits and symptoms indicate important differences in treatment needs.

Though many studies have identified different adult MMPI profile clusters without resulting in conclusive groupings agreed upon by researchers, three profile patterns seem to appear more frequently across studies. First, a distressed profile indicating marked psychopathology has been described. Multiple scales are significantly elevated, most often including scales 2, 7, and 8. A second profile cluster has been labeled “psychopathic,” with elevations on scales 4, 9, and/or 2. The third profile has demonstrated a lack of clinically significant psychopathology, some profiles with mild elevations on scales 2, 4, and/or 9 (Blashfield, 1985; Graham & Strenger, 1988; Morey & Blashfield, 1981; Nerviano & Gross, 1983). Whether or not these clusters hold true for adolescent profiles is the topic of further research.

Adolescent Subgroups Based on MMPI-A Profiles

While several more studies have attempted to classify MMPI profiles of substance abusers according to meaningful subtypes, most of this research was conducted on adult, male alcoholics. One cluster analytic study addressing adolescent substance abusers in residential substance abuse treatment was conducted by Massey, Walfish, and Krone in 1992 with a sample of 250 clients admitted consecutively to residential substance abuse treatment in a private, not-for-profit program. Marijuana was the adolescents' substance of choice (69%), followed by alcohol (18%) and cocaine (13%). Sixty-six percent of their sample were male, and 93% were Caucasian with an average age of 16 years old. Adolescents were assessed five to seven days after they were transferred to the unit from detox. Using the original MMPI with old adolescent norms, they identified three clusters of clients: (a) one subgroup of 41 clients (16%) (Cluster 1) exhibiting high levels of broad psychopathology with peaks on scales 1 and 4 and significant elevations on scales 8, 2, 3, and 7; (b) another subgroup of 97 clients (39%) (Cluster 2) revealing an impulsive, acting-out style of personality with a peak on scale 4; and (c) a final subgroup of 112 clients (45%) (Cluster 3) showing a lack of any clinically significant elevations.

Massey et al. (1992) validated their clusters by testing differences between mean cluster scores on eight variables for significance: (a) number of previous hospitalizations (Cluster 3 had significantly fewer than Cluster 2); (b) years of education (Cluster 1 had significantly less than Clusters 2 and 3, and Cluster 3 appeared to have more education than Cluster 2); (c) severity of depression (Cluster 1 was significantly more depressed than Clusters 2 and 3, and Cluster 3 was significantly less depressed than Cluster 2); (d) level of anxiety (Cluster 1 was significantly more anxious than Clusters 2 and 3, and

Cluster 3 was significantly less anxious than Cluster 2); (e) trait level of anger (Cluster 3 was significantly less angry than Cluster 1 and 2); (f) level of internalized anger (Cluster 3 internalized significantly less anger than Clusters 1 and 2); (g) level of externalized anger (Cluster 3 externalized significantly less anger than Clusters 1 and 2); and (h) alcohol dependency (alcohol dependence was significantly lower in Cluster 3 than Clusters 1 and 2).

Although the MMPI has been a clinical assessment tool used widely with adolescents, several significant issues surround its use with this population. The MMPI was not designed for adolescents. Language, item content, and reading level are geared toward adults (Archer, Maruish, Imhof, & Piotrowski, 1991). Two more points of contention involve whether to use adult, K-corrected, or adolescent norms when scoring and interpreting profiles and whether or not adult scale and code-type descriptors are accurate for adolescents (Archer, 1984; Archer, Gordon, Gianetti, & Singles, 1988; Archer et al., 1991; Butcher & Pope, 1992; Butcher et al., 1992; Colligan & Offord, 1989; Ehrenworth & Archer, 1985; Gallucci, 1994; Hathaway & Monachesi, 1963; Lachar, Klinge, & Grisell, 1976; Marks, Seeman, & Haller, 1974; Pancoast & Archer, 1988; Williams & Butcher, 1989). Studies in this area did not lead to clear conclusions, but they did point toward the need to develop an adolescent version of the MMPI.

In response to these issues surrounding the MMPI, the MMPI Restandardization Project Committee was created in 1989 and subsequently developed two separate, updated versions of the instrument. The adult version, the MMPI-2 (Butcher et al., 1989) with new adult norms, would not be used with adolescents. Instead, the Minnesota

Multiphasic Personality Inventory - Adolescent (MMPI-A) was created with nationally representative adolescent norms (Butcher et al., 1992). Once the MMPI-A was released, research was needed to assess the applicability of adolescent literature on the original MMPI to the new adolescent version (Archer, 1997a, 1997b), including the subtyping of substance abusing adolescents. For example, Gallucci (1997) classified adolescent substance abusers in psychiatric inpatient or day hospital into three distinct groups: (a) behavioral undercontrol; (b) absence of behavioral undercontrol; and (c) behavioral undercontrol combined with overcontrol. Scales 2, 4, 9, and 3 of the MMPI-A made significant contributions in defining these types.

In summary, there is a need to further research subgroups of adolescent substance abusers. Past MMPI studies in this area have focused mainly on adult male alcoholics and have utilized the original version. When adolescents have been studied, the practice of using the original MMPI version has been questioned in terms of both content and scoring. The adolescent version of the MMPI was designed to address identified problems with the original, but it calls into question the generalizability of the wealth of previous adolescent MMPI research. To determine if results from adolescent studies with the original version hold true for adolescent studies using the MMPI-A, additional research needs to be conducted.

Research Goals

In an effort to extend the results of Massey et al.'s 1992 work across MMPI test

versions and agency settings, one goal of this research was to analyze the MMPI-A profiles of adolescents in residential substance abuse treatment. The second goal of this research was to explore and describe the resultant clusters more thoroughly. Massey et al. (1992) did not define their subgroups beyond client scores on other assessment instruments such as the Beck Depression Inventory, number of previous hospitalizations, and years of education. Since empirically derived clusters based on multiple defining characteristics may provide the most promise (Babor et al., 1992a), this study incorporated several other descriptors which would provide a better picture of the complexity inherent in adolescent substance abusers. GAIN scale scores and their associated behaviors and problems related to substance use, risk-taking, mental health, environment and living situation, legal involvement, and vocational status would help define clusters.

Additionally, this study attempted to address issues identified in other research related to defining subtypes of adolescent substance abusers. Rather than adult male alcoholics and/or the original version of the MMPI, this research examined adolescent MMPI-A profiles of clients in residential substance abuse treatment. This study also attempted to evaluate and establish the reliability and validity of the identified clusters, a step which has not always been described in previous works.

By contributing to the body of knowledge regarding subtypes of adolescent substance abusers, clinicians may have a clearer idea of which types of clients produce particular MMPI-A profiles and the likely characteristics, histories, and problems which occur with them. This information could aid in the formulation of interventions, client

retention, and the individualization of treatment planning.

CHAPTER III

METHODOLOGY

Description of the Sample

Data for this research were collected from the clinical and research records of adolescents treated in the residential substance abuse program of Chestnut Health Systems in Bloomington, Illinois. The Bloomington Adolescent Treatment Program, also known as Lighthouse, is a division of Chestnut Health Systems and is accredited by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO). Lighthouse began in 1974 as a “drop in center” for adult alcohol and drug users in Bloomington, Illinois. In 1985, the adolescent treatment program established its first residential facility with short-term (7 - 40 days) and long-term (40 days - 6 months) lengths of stay. Adolescents between the ages of 12 and 18 years old are admitted from throughout the state of Illinois and a mix of rural and urban communities.

All clients admitted into residential treatment meet the appropriate criteria for this level of care based on the American Society of Addiction Medicine’s Patient Placement Criteria for the Treatment of Psychoactive Substance Use Disorders (PPC-2; American Society of Addiction Medicine, 1996). To meet criteria for residential treatment, adolescents must have been diagnosed with substance abuse or dependence and present with problems meeting severity criteria in at least two out of the following six dimensions: (a) Acute Intoxication and Withdrawal Potential; (b) Biomedical Conditions

and Complications; (c) Emotional/Behavioral Conditions and Complications; (d) Treatment Acceptance/Resistance; (e) Relapse Potential; and (f) Recovery Environment (PPC-2; American Society of Addiction Medicine, 1996). For instance, clients recommended for residential treatment may live in a high-risk environment where most family and friends use substances, and these same clients may also have high treatment resistance. Treatment programs will have difficulty engaging outpatient clients who return home to this environment every day and do not want to quit using drugs. In essence, residential clients come to treatment with problems that are not recommended to be addressed on an outpatient basis.

From June, 1998 through June, 2001, the residential program admitted 183 adolescents who also agreed to participate in the National Institute on Alcohol Abuse and Alcoholism's Assertive Aftercare Program (AAP) study run by the research division of Chestnut Health Systems. MMPI-A and GAIN data have already been collected for and extracted from clinical and research files as part of the AAP study. Of the 183 adolescents admitted, 100 cases were selected for this study (See *Clinical and Research Record Extraction*). The majority of these clients were male (76%) and Caucasian (75%). Eighteen percent described themselves as African-American, and 7% described themselves as of another race or ethnicity. Seventy-four percent were between the ages of 16 and 17 years old at intake. Seventy-eight percent received an alcohol abuse or dependence diagnosis, while 89% received a marijuana abuse or dependence diagnosis.

Fifty-one percent of clients were living in single parent homes at intake. Fifty percent of all referrals were from the criminal justice system, while the rest came from

family, community agencies, and other treatment providers. Eighty percent were involved with the criminal justice system. According to Chestnut Health Systems data, this sample of 183 adolescents is representative of the population of adolescents who enter residential treatment at Chestnut Health Systems (Chestnut Health Systems, 2000).

In comparison to the Massey et al. (1992) sample, the sample examined in this research also consisted of adolescents admitted to residential substance abuse treatment in a private, not-for-profit program who were administered the MMPI within one week of their admission date. The majority of both samples were male and Caucasian, with the sample of Chestnut Health Systems' adolescents consisting of slightly higher rates of males (76% vs. 66%) and lower rates of Caucasians (75% vs. 93%). Adolescents in the Massey et al. study (1992) averaged 16 years of age, and 74% of this study's sample were between the ages of 16 and 17 years old. While both samples of adolescents reported a preference for marijuana as the drug of choice and alcohol as the second substance of choice, 69% of the Massey et al. (1992) sample preferred marijuana, and 18% preferred alcohol. The sample of Chestnut Health Systems' adolescents consisted of adolescents with higher rates of marijuana abuse and dependence (89%) and of alcohol abuse or dependence (78%). When compared with the Massey et al. (1992) sample, the sample used for this study showed some similar trends in demographic and clinical characteristics yet were different enough to warrant caution when interpreting the results of this research as an extension of the Massey et al. (1992) study.

Assessments

Minnesota Multiphasic Personality Inventory-Adolescent (MMPI-A)

The MMPI-A is a revised version of the original adult-oriented MMPI specialized for adolescents. In response to issues surrounding use of the original MMPI with adolescents, the MMPI Restandardization Project Committee developed two separate, updated versions of the instrument. The adult version, the MMPI-2, was not meant for use with adolescents. Instead, the Minnesota Multiphasic Personality Inventory - Adolescent (MMPI-A) was created with nationally representative adolescent norms in 1989 (Butcher et al., 1992). The normative sample consisted of junior high and high school students in several regions across the United States to maximize the ability to obtain a balanced sample according to region and ethnic background. A clinical sample of adolescents was recruited from substance abuse, mental health, and other treatment facilities in the Minneapolis area (Butcher et al., 1992). On the MMPI-A, a total of 70 items that used obsolete language or seemed awkward, ambiguous, or sexist were rewritten to improve face validity and to decrease perceived offensiveness (Butcher et al., 1992). The test item pool was shortened (Archer, 1994; Butcher et al., 1992), including 20 items which performed the same or better psychometrically as the original version (Williams, Ben-Porath, & Hevern, 1994). The result was an instrument containing 478 true/false items that can be hand scored. Sample items include, "My teachers have it in for me," "My feelings are not easily hurt," and "My parents often object to the kind of people I go around with" (Butcher et al., 1992).

Other psychometric data proved that the MMPI-A performs well. A sub-sample of normative subjects participated in a test-retest study with one week between administrations. The range of test-retest Pearson Product-Moment correlations were

comparable to test-retest correlations for adults on the MMPI-2 ($r = .65 - .84$). Many of the basic scales demonstrated strong internal consistency ($\alpha = .78$ and $.79$ in *Hs* and *Sc* respectively), and some produced relatively low to moderate coefficients ($\alpha = .40 - .43$ and $.57 - .59$ in *Mf* and *Pa* respectively) (Butcher et al., 1992).

The MMPI-A is most frequently used in psychiatric, medical, alcohol and drug treatment, and correctional settings (Butcher et al., 1992). In research settings, it has been used to examine personality and psychopathology. In clinical settings, it may be used to assess personality, behavior, and psychopathology issues that will be addressed in treatment planning. Chestnut Health Systems administers the MMPI-A routinely to help determine client treatment needs and is completed within the first week of treatment, typically once the adolescent has adjusted to the unit.

Chestnut Health Systems allows adolescents to self-administer MMPI-A items from a paper booklet. Scoring keys are placed on the answer sheet by staff and lined up with marks on the paper. The number of responses showing in designated spaces are counted and entered as the raw scale score on a gender specific profile sheet for the three basic validity scales and 10 clinical scales. Corresponding T-score values for each raw score are identified and marked on the profile sheet, and all points are connected with a line to form the profile. Typically, as the T-score increases, the person is described as more pathological.

Global Assessment of Individual Needs (GAIN)

The Global Assessment of Individual Needs (GAIN; Dennis, 1991) is an

instrument that was designed to meet the assessment needs of clinicians, administrators, and researchers and has been normed on both adults and adolescents (Dennis, Scott, Godley, & Funk, 1999). Development of the GAIN (Appendix A) was intended to help document the information mandated by the release of new (at the time) diagnostic criteria, accreditation standards, and patient placement criteria as well as the introduction of managed behavioral health care and outcome monitoring (Dennis, 1991).

Prior to administration of the full GAIN, clients are assessed to verify that they possess the necessary cognitive skills to understand and answer the questions. A modified version of the 10 item Short Blessed Scale of Cognitive Impairment (Katzman et al., 1983) is included in the beginning of the GAIN and is conducted each time a GAIN is started. This version of the scale includes the following six items: (a) “What year is it now?”; (b) “What month is it now?”; (c) “Please repeat this phrase after me: John Brown, 42 Mark Street, Detroit,” which is asked to be repeated again from memory at the end of the test; (d) “About what time is it?”; (e) “Please count backwards from twenty to one”; and (f) “Please say the months of the year in reverse order.”

Once questions are answered, points are assigned for each item according to number of errors. If more than 10 points accumulate after item scores are added, the interviewer attempts to ascertain the source of the problem, since high scores may be the result of current intoxication, temporary or permanent mental or biological problems, or knowledge deficits. In particular, it is not uncommon for adolescents to score higher than 10. Interviews are rescheduled if the client is suspected to be intoxicated or the problem appears to be transitory. If the interviewer decides to proceed in spite of a higher score,

for example if the client may have lacked education in months of the year, the interview will most likely be more difficult and/or take longer. The GAIN is not administered or administration is stopped if the client is unable to understand the meaning of questions consistently.

Item content in the main body of the GAIN is divided into the following eight sections: Background and Treatment Arrangements, Substance Use, Physical Health, Risk Behaviors, Mental Health, Environment and Living Situation, Legal, and Vocational. Questions assess for the nature and recency of problems and service utilization in each area. The Substance Use and Mental Health sections include questions based on diagnostic criteria as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994) for substance abuse and dependence, conduct disorder, and attention-deficit hyperactivity disorder. Other GAIN items are designed to provide clinicians with appropriate patient placement criteria and to gather information required for the state client data system. GAIN items are also designed for comparison to the National Household Survey on Drug Abuse (Office of Applied Studies, 1996).

The GAIN (Appendix B) includes over 100 indices, most of which are internally consistent. Key indices, and their alphas where applicable, are: Substance Problem Index ($\alpha = .88$), Substance Frequency Index ($\alpha = .87$), General Mental Distress Index ($\alpha = .95$), Traumatic Stress Index ($\alpha = .92$), Treatment Resistance Index, Treatment Motivation Index, Self Efficacy Index ($\alpha = .76$), Environmental Risk Index ($\alpha = .79$), General Victimization Index ($\alpha = .87$), Other Sources of Stress Index, General Social Support

Index ($\alpha = .81$), and Illegal Activities Index ($\alpha = .73$) (Dennis, 1999). High alphas suggest the high internal consistency of these indices.

A test-retest study of the GAIN items measuring days of use in the past 90 days and lifetime DSM-IV substance abuse and dependence symptoms was conducted with 210 adolescents receiving outpatient substance abuse treatment. Both administrations were conducted within 48 hours of each other. Results revealed consistent but increasing numbers of days of marijuana use ($r = .74$, 31 vs. 34 days), days of alcohol use ($r = .74$, 6 vs. 7 days), and abuse and dependence symptoms ($r = .73$, 4.6 vs. 5.3 lifetime), as well as the number of adolescents reporting lifetime dependence between the two administrations (kappa = .55, 40% vs. 44% lifetime dependence) (Dennis & Titus, 2000; Dennis et al., 2000).

A separate validation study compared GAIN data with data obtained via the Form 90, a time-line follow-back method of recording daily substance usage over a 90 day period, using a calendar and significant events to enhance accuracy of memory (Miller, 1996; Miller & Del Boca, 1994). The GAIN was validated with the Form 90 in terms of both reported days of alcohol ($r = .84$) and marijuana use ($r = .85$) and peak breath alcohol content levels ($r = .73$) (Dennis, Funk, Godley, Godley, & Waldron, 2001). Adolescent reports of past-month use were also consistent with results from on-site urine tests for THC (50 ng/ml) at treatment intake (kappa = .53) (Godley, Godley, Dennis, Funk, & Passetti, in press).

Currently used as the biopsychosocial clinical assessment at Chestnut Health Systems, the GAIN is one of the most widely used measures in adolescent treatment

studies in the United States (Buchan, Tims, & Dennis, 2000; Dennis et al., 2000; Dennis et al., 2001; Dennis, Noursi, & Muck, in press; Stevens & Morral, 2001). Chestnut Health Systems has administered the GAIN for several years to evaluate and place adolescents into the appropriate level of substance abuse treatment. It is orally administered by clinical or research (when the client is involved with a study) staff within two weeks before or after the adolescent enters residential treatment.

Items are typically multiple choice, yes/no, and fill-in-the-blank and include skip patterns so that irrelevant questions based on previous responses are not asked. Sample items include, "Have you ever attended AA, CA, NA or another self-help group for your alcohol or drug use? Y/N," and, "During the past 90 days, on how many days have you attended one or more self-help group meetings?" The sum of answers to groups of multiple choice items throughout the instrument form indices or scale scores, such as the Substance Problem Index. Scale scores are categorized as fitting into low, clinical, or acute ranges. Tables are available to assist with these calculations. Typically, the more items endorsed within a scale, the more problematic that area is for the adolescent.

To describe the MMPI-A profile clusters from this study, mean GAIN index scores were compared across clusters to look for significant differences between them. The following substance and mental health indicators were chosen to be examined: (a) substance use problems and substance use frequency as measured by the Substance Problem Index and Substance Frequency Index; (b) symptoms of depression, anxiety, traumatic stress, attention deficit disorder, conduct disorder, and general mental distress as measured by the Depressive Symptom Index, Anxiety Symptom Index, Traumatic

Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, and General Mental Distress Index; (c) treatment motivation, treatment resistance, and perceived self-efficacy to abstain from substances as measured by the Treatment Motivation Index, Treatment Resistance Index, and Self-Efficacy Index; (d) risk in the living, vocational, social, and general environment as measured by the Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, and Environmental Risk Index; (e) general victimization as measured by the General Victimization Index; and (f) sources of stress, level of general social support, and engagement in illegal activity as measured by the Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index.

Collection of the Data

Clinical and Research Record Extraction

Data for this study were extracted from Chestnut Health Systems' clinical and research files of adolescents who were admitted to residential care between June, 1998 and June, 2001. Permission was granted by the clinical director of Chestnut Health Systems on April 16, 1998 (see Appendix B) and by the Chestnut Health Systems' Institutional Review Board on September 19, 2001 (see Appendix C) to collect and analyze this information. The majority of data for this study had been collected as part of the National Institute on Alcohol Abuse and Alcoholism's Assertive Aftercare Protocol (AAP) study conducted by the research division of Chestnut Health Systems. To be included in this study, the client must have had a complete GAIN in a research record and

a complete MMPI-A in the clinical record. Clients were excluded if there were over 30 omitted items from the MMPI-A, F scale T-scores greater than 90, (Butcher, Graham, & Ben-Porath, 1995) or if their stay in residential treatment was less than seven days long. Adolescents who left treatment in less than seven days could not complete the intake assessment battery required to be enrolled in the AAP study. Also, very short lengths of stay increased the probability that an MMPI-A was not completed. All GAIN data were reviewed, critiqued, and corrected when possible by research staff as part of quality assurance procedures to ensure information is analyzable.

To determine if adolescents included in this study differed significantly from adolescents excluded from the study, several descriptors were compared between the two groups. Excluded adolescents were mostly male (66%) and Caucasian (72%). Seventeen percent described themselves as African-American, and 12% described themselves as of another race or ethnicity. Fifty percent were between the ages of 16 and 17 years old at intake. Seventy-four percent received an alcohol abuse or dependence diagnosis, while 89% received a marijuana abuse or dependence diagnosis.

Fifty-two percent of clients were from single parent homes at intake. Fifty percent of all referrals were from the criminal justice system, while the rest came from family, community agencies, and other treatment providers. Eighty-four percent were involved with the criminal justice system. Chi-square tests revealed that the two groups were similar on most of these descriptors. The groups differed significantly only in age, with this study's sample including more adolescents between 16 and 17 years old than the excluded adolescents group ($p < .001$).

Adherence to Ethical Requirements

According to Section 42, Chapter 1 of the Code of Federal Regulations, no separate consent form for this study was required by law since agency data are allowed to be released to “qualified personnel for the purpose of conducting scientific research as long as identities are not revealed” (Public Health Service, 1993, p. 7). For this reason, debriefing was also not required and was not conducted. Admission to the residential treatment program was voluntary, and clients had the right to refuse treatment or assessments at any time. The adolescent and legal guardian also signed forms at admission stating that information in clinical files may be used for research purposes by Chestnut Health Systems staff.

No extraordinary or invasive procedures were used in the process of data extraction from the clinical records, while every effort was made to maintain the confidentiality of clients. Client data were entered into secure databases at Chestnut Health Systems, and all identification numbers, including AAP name-linked study numbers, were stripped from the data to protect confidentiality. Clients received a “thesis identification number,” and hard copies of data were kept in a locked file cabinet on Chestnut Health Systems property. Any data collected were reported in summary form only without identifying individuals. No names or identifying information appeared on any document or in any database related to this research.

The risk of breaching confidentiality due to mandated child abuse reporting laws or imminent threat of harm to self or others was minimal since these issues were most likely already dealt with during the course of treatment. No physiological or

psychological risk was anticipated since this research required only record reviews and no interaction with clients or outside agency staff. Therefore, the possibility of unauthorized disclosure of sensitive information was minimal. It appeared that the potential benefits of gaining knowledge that may help treat adolescent substance abusers outweighed the potential risks to clients.

Analyses

Initially, a MANOVA was conducted on the MMPI-A scale T-scores from the 100 profiles examined in this study to test for significant differences between male and female profiles. When no significant differences were identified, they were pooled for cluster analysis on the three validity and 10 clinical scales of all profiles. An agglomerative hierarchical clustering method, known as Ward's method, was implemented to divide the group of cases into homogenous subgroups.

Next, a series of MANOVAs was conducted for individual GAIN indices to verify the homogeneity of each scale. The Kruskal-Wallis test was applied to any scale that violated the homogeneity of variance to confirm the assumption of equal population variances and the interpretability of the MANOVA results. To avoid inflating the significance of results due to multiple comparisons, the T-test used by Massey et al. (1992) was replaced by the Tukey Honestly Significant Difference Test to test for significant differences between mean GAIN index scores for each cluster.

The following mean GAIN index scores were compared: Substance Problem Index, Substance Frequency Index, Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index,

General Mental Distress Index, Treatment Motivation Index, Treatment Resistance Index, Self-Efficacy Index, Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, Environmental Risk Index, General Victimization Index, Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index. More detailed descriptions of the analyses can be found in the results section in Chapter 4.

Hypotheses

Both the Massey et al. (1992) study and Chestnut Health Systems' samples consisted of adolescent, mostly male, mostly Caucasian substance abusers who were administered the MMPI-A within one week of their admission to residential treatment. The drug of choice for both samples was marijuana followed by alcohol. Since the samples resembled each other in these ways, it was predicted that the clusters of MMPI-A profiles identified in this study would resemble the ones found by Massey et al. (1992): (a) a subgroup exhibiting high levels of broad psychopathology; (b) a subgroup revealing an impulsive, acting-out style of personality; and (c) a final subgroup showing a lack of clinically significant elevations. Major deviations were not expected even though the sample for this study was slightly older with higher numbers of males, lower numbers of Caucasians, higher rates of marijuana abuse and dependence, and higher rates of alcohol abuse or dependence (see *Description of Sample* for specific details). It was hypothesized that this study would not yield substantially different clusters than the Massey et al. (1992) one since the same three clusters have been identified in several studies with

different populations, most notably adult male alcoholics (Blashfield, 1985; Graham & Strenger, 1988; Morey & Blashfield, 1981; Nerviano & Gross, 1983).

It was also predicted that mean GAIN scores on the Substance Problem Index, Substance Frequency Index, Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, and the General Mental Distress Index would distinguish MMPI-A profile clusters from one another. These indices appeared to reflect the substance abuse symptoms and psychopathology which discriminated between the three common profiles described in Chapter 2. No prediction was made regarding the Treatment Motivation Index, Treatment Resistance Index, Self-Efficacy Index, Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, Environmental Risk Index, General Victimization Index, Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index since this was meant as an exploratory analysis for identifying cluster-distinguishing variables not included in other research.

In this study, MMPI-A scales elevated to a T-score of 65 or greater were considered clinically significant, and T-scores between 60 and 65 were considered a moderate transition area between normal and clinical elevations. Clinical scale codetypes were not examined since descriptors used for interpretation of codetypes with adolescents have not been empirically validated (Butcher et al., 1992).

CHAPTER IV

RESULTS

Comparison of Male and Female Profiles

Prior to cluster analysis, a MANOVA was conducted on the MMPI-A scale T-scores from the 100 profiles examined in this study to test for significant differences between male and female profiles. As could be predicted, scale 5 differed significantly between the two groups, $F(1, 99) = 19.12, p = .000$, with a small to medium effect size (partial $\eta^2 = .163$). Males obtained a mean T-score of 46, and females reached a mean T-score of 55. To check that T-scores were normally distributed within each scale and that the variation of scores in each group was not reliably different, Levene's Test of Equality of Error Variances was performed and revealed that error variance was equal across both groups (partial $\eta^2 = .995$). No other significant differences were identified between male and female profiles, indicating that they could be pooled for cluster analysis.

Cluster Identification

Next, a cluster analysis was performed on the three validity and 10 clinical scales of the 100 MMPI-A profiles. Cluster analysis formed similar groups of persons, or typologies, across a set of variables that represented different patterns in the data. When analyzing the MMPI-A, this analysis accounted for the elevations, shape, and scatter of all validity and clinical scales at once in order to group similar profiles.

Steps for performing and reporting on cluster analyses outlined by Borgen and

Barnett (1987) and Blashfield (1985) were followed. First, a proximity measure was calculated by SPSS. It calculated the proximity or like index (similarity) between each pair of cases using the squared Euclidian distance, with similarity increasing as the correlation increased. Once the proximity index was defined for each pair of cases, they were arranged in a proximity matrix. Cases were arranged in the matrix according to the value of the proximity index.

Next, an agglomerative hierarchical clustering method, known as Ward's method, was implemented to divide the group of cases into homogenous subgroups. Ward's method, the preferred method of cluster analysis of MMPI data (Morey & Blashfield, 1981), grouped two cases with the smallest distance between them and merged groups in a way that keeps within group variance at a minimum at each stage of grouping. This process continued until one group was formed with a hierarchical structure. The outcome was a tree-like system on general and specific clusters and their statistical relations to one another.

Results using Ward's method suggested a four cluster solution. Roy's Largest Root, a standardized measure of effect size, indicated that a three cluster solution would have subsumed a sufficiently large number of profiles that could be meaningfully grouped on their own ($\lambda_1 = 3.32$), while a five cluster solution did not add an additional cluster with enough members that differed in a meaningful way from the four cluster solution ($\lambda_1 = 4.30$). The four cluster solution appeared to maximize between-group variance and minimize within-group variance ($\lambda_1 = 4.05$). Table 1 displays the mean MMPI-A scale T-scores and standard deviations for each of the four clusters, while Figure 1 plots the

average profile for each cluster.

Table 1

Mean MMPI-A Scale T-Scores and Standard Deviations by Cluster

Scale	Cluster							
	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
L	61.95	8.30	48.90	6.57	51.05	11.60	47.69	7.94
F	47.14	4.51	48.58	4.34	64.00	10.33	49.81	5.03
K	61.05	8.32	49.81	6.91	44.86	5.81	48.08	8.61
1 (<i>Ha</i>)	46.45	8.40	43.00	7.16	56.76	7.56	51.04	6.37
2 (<i>D</i>)	51.41	4.11	43.68	5.38	59.67	10.97	56.12	6.98
3 (<i>Hy</i>)	55.18	9.09	44.03	7.05	54.38	7.88	51.54	6.77
4 (<i>Pd</i>)	55.95	8.05	54.87	5.93	67.90	7.97	60.69	8.67
5 (<i>Mf</i>)	51.14	10.70	47.74	8.37	51.62	7.59	43.88	6.85
6 (<i>Pa</i>)	47.59	5.92	48.84	6.32	66.90	12.31	51.23	5.34
7 (<i>Pt</i>)	40.55	6.03	44.48	4.78	61.95	7.03	51.50	5.67
8 (<i>Sc</i>)	40.59	5.63	44.65	4.56	66.14	9.42	49.00	5.29
9 (<i>Ma</i>)	45.59	6.81	57.61	9.52	66.86	14.43	55.92	11.42
0 (<i>Si</i>)	39.45	6.62	41.10	8.08	53.14	7.64	49.50	8.02

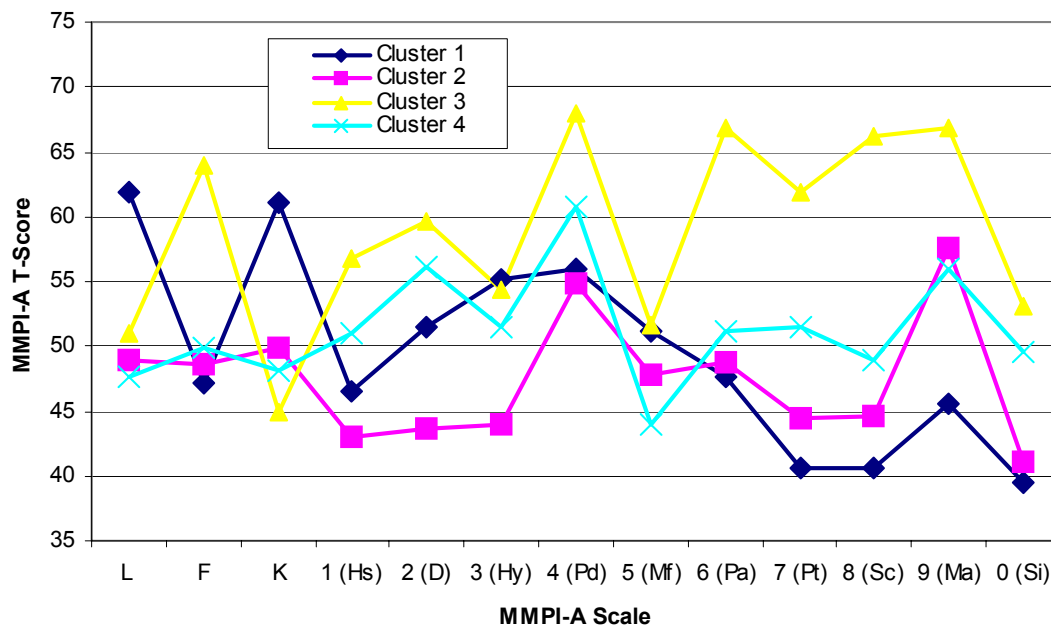


Figure 1. MMPI-A Profiles of Four Clusters.

Cluster Validation

A series of MANOVAs was then conducted for individual GAIN indices to verify the homogeneity of each scale. The Traumatic Stress Index (TSI) was the only scale that violated the homogeneity of variance, and the Kruskal-Wallis Test confirmed the assumption of equal population variances and the interpretability of the MANOVA results (see Table 2 for mean GAIN scale scores and standard deviations for each cluster).

Table 2

Mean GAIN Scale Scores and Standard Deviations by Cluster

Scale	Cluster							
	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Substance Problem Index	9.18	5.32	10.13	4.59	8.14	5.93	10.23	4.83
Substance Frequency Index	.15	.18	.15	.17	.17	.22	.19	.22
Depressive Symptoms Index	1.64	1.56	1.87	1.67	3.38	1.91	3.58	1.72
Anxiety Symptoms Index	1.82	1.89	1.58	1.96	4.00	2.72	2.96	2.51
Traumatic Stress Index	2.27	3.48	1.84	2.34	4.95	4.09	4.15	3.70
Attention Deficit Disorder Index	5.86	5.10	7.90	5.26	11.19	6.15	9.73	5.43
Conduct Disorder Index	3.77	3.58	3.71	2.64	4.33	3.53	5.00	3.57
General Mental Distress Index	4.55	4.21	4.42	4.02	8.95	5.61	8.15	4.83
Treatment Motivation Index	2.89	.96	2.62	1.18	3.00	1.70	2.88	.78

Table 2 (continued).

Scale	Cluster							
	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Treatment Resistance Index	.83	.86	1.00	.85	1.59	1.12	1.56	1.23
Self-Efficacy Index	4.39	.92	4.07	1.13	3.71	1.57	3.68	1.52
Living Environment Risk Index	6.67	2.50	6.25	3.03	8.89	4.79	6.13	4.55
Vocational Environment Risk Index	7.22	6.09	5.92	6.07	7.72	5.75	7.65	7.42
Social Environment Risk Index	11.39	5.75	11.63	4.28	11.17	5.16	11.52	6.52
Environment Risk Index	25.28	10.16	23.79	10.20	27.78	11.84	25.30	14.75
General Victimization Index	4.14	3.03	4.03	3.37	4.45	3.39	4.88	2.42
Personal Sources of Stress Index	1.36	1.05	1.16	1.21	2.05	1.61	1.85	1.26
Other Sources of Stress Index	1.55	1.95	1.48	1.90	1.65	1.90	1.77	1.84
General Sources of Stress Index	7.05	2.30	7.26	1.93	6.50	2.44	6.73	2.18

Table 2 (continued).

Scale	Cluster							
	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Personal Crime Index	1.36	1.73	.97	1.22	1.48	1.63	2.12	2.08
General Crime Index	3.36	3.71	2.80	2.86	3.95	3.31	4.65	4.13
Illegal Activity Index	.22	.23	.22	.21	.28	.25	.28	.30

Clusters were then validated by comparing mean T-scores on GAIN indices. The following mean GAIN index scores were compared: Substance Problem Index, Substance Frequency Index, Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, General Mental Distress Index, Treatment Motivation Index, Treatment Resistance Index, Self-Efficacy Index, Living Environmental Risk Index, Vocational Environmental Risk Index, Social Environmental Risk Index, Environmental Risk Index, General Victimization Index, Personal Sources of Stress Index, Other Sources of Stress Index, General Social Support Index, Property Crime Index, General Crime Index, and Illegal Activity Index. Table 3 summarizes the results.

Table 3

Tests for Between-Subjects Effects of GAIN Indices

Scale	<i>df</i>	<i>F</i>	Partial η^2	<i>p</i>
Substance Problem Index	3	.85	.03	.47
Substance Frequency Index	3	.23	.01	.88
Depressive Symptoms Index	3	8.46	.21	.00
Anxiety Symptoms Index	3	5.76	.15	.001
Traumatic Stress Index	3	4.81	.13	.004
Attention Deficit Disorder Index	3	3.95	.11	.011
Conduct Disorder Index	3	.87	.03	.46
General Mental Distress Index	3	6.40	.17	.001
Treatment Motivation Index	3	.46	.02	.71
Treatment Resistance Index	3	2.96	.10	.04
Self-Efficacy Index	3	1.31	.04	.28
Living Environment Risk Index	3	2.18	.08	.10
Vocational Environment Risk Index	3	.39	.01	.76
Social Environment Risk Index	3	.03	.00	.99
Environment Risk Index	3	.38	.01	.77
General Victimization Index	3	.41	.01	.74
Personal Sources of Stress Index	3	2.59	.08	.06
Other Sources of Stress Index	3	.12	.00	.95
General Sources of Stress Index	3	.58	.02	.63
Property Crime Index	3	2.24	.07	.09
General Crime Index	3	1.39	.04	.25
Illegal Activity Index	3	.50	.02	.69

To avoid inflating the significance of results due to multiple comparisons, the T-test used by Massey et al. (1992) was replaced by the Tukey Honestly Significant Difference Test to test for significant differences between mean GAIN index scores for each cluster. Results are summarized in Table 4. No further adjustments were made to the significance level to avoid Type I errors. The Bonferroni procedure was considered too conservative for the exploratory aspect of this analysis, especially since this study's analyses were already low in statistical power from a limited sample size.

Table 4

Trends and Significant Differences Between Cluster Means on Validation Variables

GAIN scale	<i>p</i>	Cluster 1	Cluster 2	Cluster 3	Cluster 4
General Mental Distress Index	.001	4.55 _a	4.42 _a	8.95 _b	8.15 _b
Anxiety Symptoms Index	.001	1.82 _a	1.58 _a	4.00 _b	
Traumatic Stress Index	.004	2.27 _a	1.84 _a	4.95 _b	
Attention Deficit Disorder Index	.011	5.86 _a		11.19 _b	
Depressive Symptoms Index	.000	1.64 _a	1.87 _a	3.38 _b	3.58 _b
Property Crime Index	.090		.97 _a		2.12 _a
Personal Sources of Stress Index	.060		1.16 _a	2.05 _a	
Treatment Resistance Index	.040	.83 _a			1.56 _a
Living Environment Risk Index	.100			8.89 _a	6.13 _a

Note. Means having the same subscript are not significantly different at $p < .01$ in the Tukey Honestly Significant Difference comparison.

Cluster 1

In the four cluster solution, Cluster 1 (Figure 2) consisted of 22 MMPI-A profiles. No validity or clinical scale was elevated beyond a T-score of 62. Scales L and K were moderately elevated, with T-scores of 62 and 61, respectively. The highest clinical scales in the profile were scale 4 at a T-score of 56 and scale 3 at a T-score of 55.

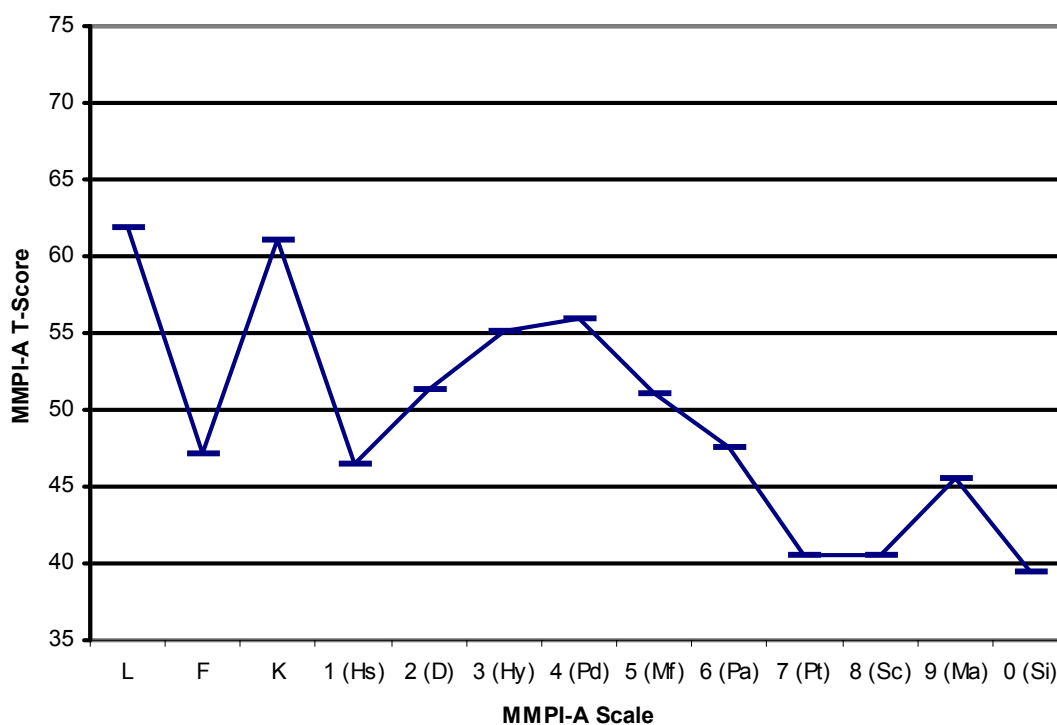


Figure 2. MMPI-A Profile of Cluster 1.

According to the Tukey HSD test, Cluster 1 individuals scored significantly lower than Cluster 3 on the General Mental Distress Index ($p = .013$), on the Anxiety Symptoms Index ($p = .012$), on the Traumatic Stress Index ($p = .052$), on the Attention Deficit

Disorder Index ($p = .010$), and on the Depressive Symptoms Index ($p = .007$). Cluster 1 also scored significantly lower than Cluster 4 on the General Mental Distress Index. ($p = .042$) and the Depressive Symptoms Index ($p = .001$). Cluster 1 scored lower than Cluster 4 ($p = .106$) on the Treatment Resistance Index at a level which may have reached statistical significance with a larger sample size.

Cluster 2

The average MMPI-A profile for Cluster 2 ($n = 31$) showed no significant validity or clinical scale elevations (see Figure 3). Scale 9 was the peak with a T-score of 58, and

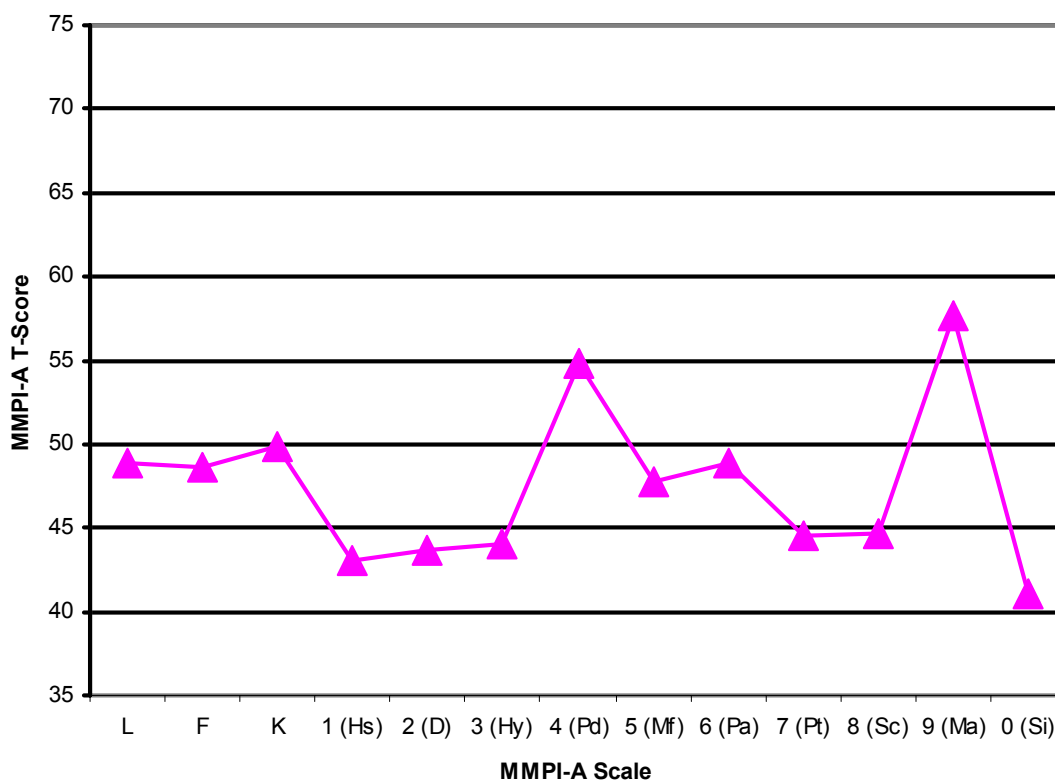


Figure 3. MMPI-A Profile of Cluster 2.

scale 4 was secondary with a T-score of 55. Cluster 2 adolescents scored significantly lower than Cluster 3 on several indices: the General Mental Distress Index ($p = .004$), the Anxiety Symptoms Index ($p = .002$), the Traumatic Stress Index ($p = .008$), and the Depressive Symptoms Index ($p = .013$). Cluster 2 also scored significantly lower than Cluster 4 on the General Mental Distress Index ($p = .017$) and the Depressive Symptoms Index ($p = .002$). Cluster 2 tended to score lower than Cluster 4 on the Property Crime Index ($p = .055$) and lower than Cluster 3 on the Personal Sources of Stress Index ($p = .08$). A larger sample size may have revealed differences reaching significance.

Cluster 3

Twenty-one profiles were included in Cluster 3. Scales F, 4, 6, 8, and 9 on the MMPI-A were all elevated above a T-score of 65, and Scale 2 was moderately elevated (T-score of 60). The average Cluster 3 profile is plotted in Figure 4.

Members of Cluster 3 scored significantly higher than Clusters 1 and 2 on the General Mental Distress Index ($p = .013$; $p = .004$), the Anxiety Symptoms Index ($p = .012$; $p = .002$), the Traumatic Stress Index ($p = .052$; $p = .008$), and the Depressive Symptoms Index ($p = .007$; $p = .013$). Additionally, Cluster 3 scored significantly higher than Cluster 1 on the Attention Deficit Disorder Index ($p = .010$). Cluster 3 individuals scored higher than Cluster 2 on the Personal Sources of Stress Index ($p = .08$) and higher than Cluster 4 on the Living Environment Risk Index ($p = .11$), but these differences may have reached significance with a larger sample size.

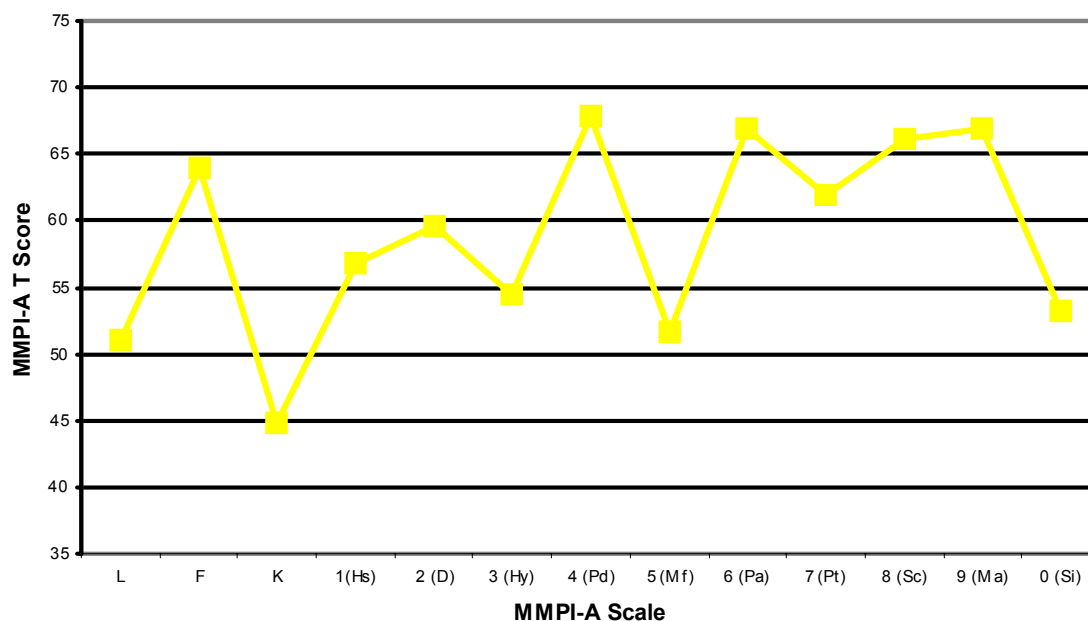
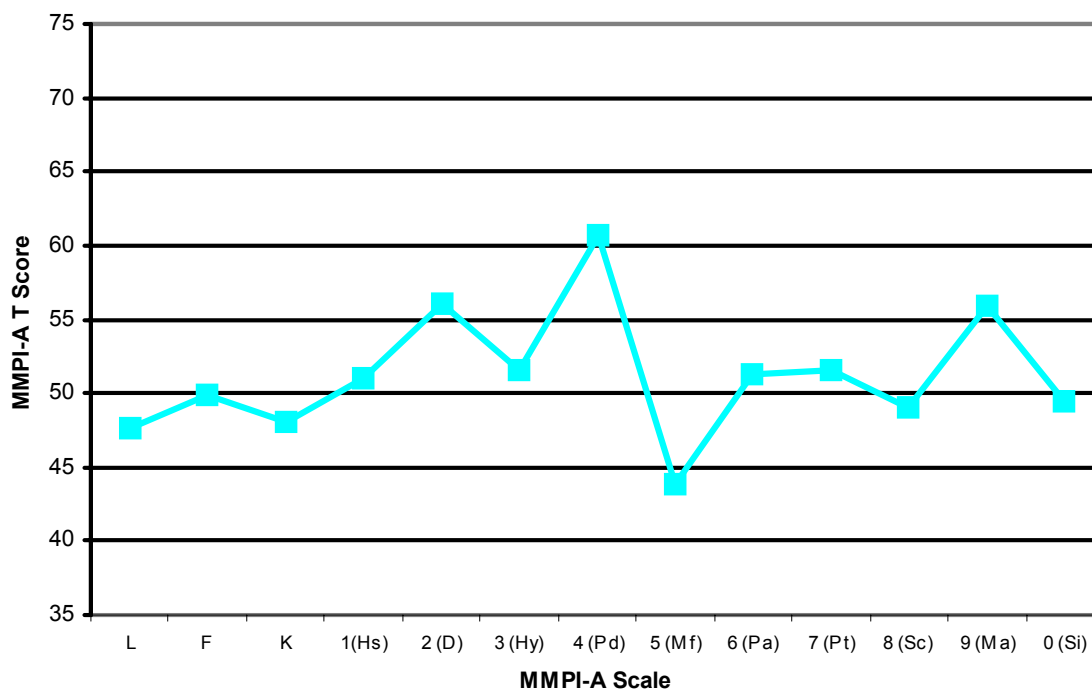


Figure 4. MMPI-A Profile of Cluster 3.

Cluster Four

Cluster 4 ($n = 26$) produced no clinically significant elevations above a T-score of 65 on the MMPI-A but did show a moderate elevation on scale 4. Scale 4 represented the peak of the Cluster 4 profile (Figure 5) with a T-score of 61. The Tukey HSD test revealed that Cluster 4 scored significantly higher than Clusters 1 and 2 on the General Mental Distress Index ($p = .042$; $p = .017$) and the Depressive Symptoms Index ($p = .001$; $p = .002$). In terms of differences that did not reach significance but may have with a larger sample size, Cluster 4 tended to score higher than Cluster 1 on the Treatment Resistance Index ($p = .106$) and to score higher than Cluster 2 on the Property Crime

Index ($p = .055$). Cluster 4 also tended to score lower than Cluster 3 on the Living



Environment Risk Index ($p = .11$).

Figure 5. MMPI-A Profile of Cluster 4.

CHAPTER V

DISCUSSION

Possible Descriptors and Clinical Applications

Cluster 1

Cluster 1 showed a lack of any clinically significant elevations; however, Cluster 1 members seemed to be “faking good” on the MMPI-A, which would not be surprising for treatment-resistant adolescents. From the configuration of the L, F, and K scores and the profile peaks on scales 4 and 3 (not significantly elevated), these individuals may have presented themselves in the best possible light, felt defensive, lacked insight into their situations, and minimized or denied problems. They may have been unwilling to seek help and seen themselves as adaptive and self-reliant (Butcher et al., 1992).

According to average GAIN index scores, and somewhat unexpectedly from the MMPI-A profile, Cluster 1 individuals displayed a wide array of problems by scoring in the clinical range of severity on the General Mental Distress Index, Anxiety Symptoms Index, Traumatic Stress Index, Attention Deficit Disorder Index, and Depressive

Symptoms Index but to a significantly lesser degree than Cluster 3. Cluster 1 may have experienced internal mental distress, anxiety, traumatic stress, inattention and/or hyperactivity, impulsivity, and depression (Dennis, 1999). Even though the tendency for Cluster 1 to score lower than Cluster 4 on the Treatment Resistance Index did not reach significance with the Tukey HSD test, the scale score did fall into the clinical range on the GAIN scale, suggesting that these adolescents may have been at risk of dropping out of treatment early (Dennis, 1999). Refer to Table 4 to review significant differences between the four clusters across mean GAIN scale scores.

Chestnut Health Systems' clinical records reflected that 68% of Cluster 1 individuals were diagnosed with Conduct Disorder, 18% with Attention Deficit-Hyperactivity Disorder, 23% with Post-Traumatic Stress Disorder, 18% with a Mood Disorder, and 5% with an Anxiety Disorder. Additionally, 36% of these adolescents came to treatment directly from jail or prison, 32% were on probation, and 5% were on parole.

According to these results, Cluster 1 members could have had co-morbid mental health problems which would have warranted further assessment, including assessment for traumatic disorders and the use of substances to "escape." These adolescents may have had a history of violence and victimization in their environments that a treatment plan should address. Clinicians would also want to consider that these individuals may have a somewhat hard time in lecture or unstructured groups and may be at risk of dropping out of treatment early (Dennis, 1999).

Cluster 2

Cluster 2 showed a lack of any clinically significant elevations on the MMPI-A. L, F, and K scale scores along with profile peaks on scales 9 and 4 (not significantly or moderately elevated), suggested that Cluster 2 members may have been comfortable with themselves, independent, responding frankly, admitting to faults, and maintaining a balance between self-protection and self-disclosure (Butcher et al., 1992).

Cluster 2 adolescents' GAIN scale scores indicated that they scored significantly lower than Cluster 3, yet in the clinical range of severity, on several indices: the General Mental Distress Index, the Anxiety Symptoms Index, the Traumatic Stress Index, and the Depressive Symptoms Index. As with Cluster 1, Cluster 2 individuals appeared to display some of the same problems as Cluster 3 members, to a lesser degree but still in the clinical range. Cluster 2 scored in the low clinical range on the Property Crime Index and the Personal Sources of Stress Index, possibly indicating that these individuals might have been stealing to support drug habits, become involved in broader ranges of illegal activity, and taxed their support sources (Dennis, 1999). According to these results, Cluster 2 may have suffered from some degree of internal mental distress, anxiety, traumatic stress, and depression.

Chestnut Health Systems' clinical files revealed that out of all Cluster 2 adolescents, 65% were diagnosed with Conduct Disorder, 29% with Attention Deficit-Hyperactivity Disorder, 6% with Post-Traumatic Stress Disorder, 3% with a Mood Disorder. Thirty-two percent came to treatment directly from jail or prison, 32% were on probation, and 3% were on parole.

In a treatment environment, clinicians may want to have Cluster 2 members

assessed for co-morbid mental health issues and traumatic disorders. A careful examination of the adolescent's environment for violence, negative peer groups, and victimization may guide interventions designed to help adolescents change or cope with their living environments (Dennis, 1999).

Cluster 3

Cluster 3 adolescents appeared to display a wider array and a greater intensity of emotional problems and distress than the other three clusters. This group of 21 adolescents' scores on the three validity scales (L, F, K) suggested that they may have responded frankly to MMPI-A items and admitted that they have faults. They may also have a poor self-concept, criticize themselves and others, be conventional, or suffer from serious emotional problems. An elevated F scale may have indicated a plea for help. Additionally, Cluster 3 group members demonstrated clinically significant elevations on scales 4, 6, 8, and 9 and moderate elevations on scales 2 and 7. This profile pattern could have indicated that adolescents in this cluster were impulsive, angry, manipulative, impatient, suspicious, unreliable, resentful, and rigid, and that they may have reported family problems or tendencies to be aggressive. They may also have been described as moralistic, overly sensitive to rejection, high-strung, bored with routines and details, creative, or enterprising. Due to moderate elevations on scales 2 and 7, Cluster 3 individuals may have possibly suffered from some degree of depression and anxiety, been dissatisfied with life, lacked self-confidence, felt guilty, showed perfectionism, or tended to intellectualize (Butcher et al., 1992).

Consistent with their MMPI-A profiles, members of Cluster 3 scored in the acute

range of the General Mental Distress Index, in the mid-clinical range of the Anxiety Symptoms Index, in the acute range of the Traumatic Stress Index, and in the mid-clinical range of the Depressive Symptoms Index on the GAIN. Cluster 3 scores on these scales indicated that members of this group displayed a greater breadth and severity of internal mental distress than the other two groups, may have misinterpreted social interactions, and suffered from high levels of traumatic stress. Additionally, Cluster 3 scored in the clinical range of the Attention Deficit Disorder Index, indicating that these individuals may have presented with a persistent pattern of inattention and/or hyperactivity and impulsivity (Dennis, 1999). Cluster 3 also scored in the mid-clinical range on the Personal Sources of Stress Index and in the high clinical range on the Living Environment Risk Index, suggesting that these individuals were under stress from their personal support systems and lived in an environment hostile to recovery (Dennis, 1999).

In their treatment records, 86% of Cluster 3 adolescents were diagnosed with Conduct Disorder, 33% with Attention Deficit-Hyperactivity Disorder, 10% with Post-Traumatic Stress Disorder, 19% with a Mood Disorder, and 10% with an Anxiety Disorder. Forty-three percent came to treatment directly from jail or prison, 24% were on probation, and 5% were on parole.

When treating Cluster 3 adolescents, these results suggested the need to assess for co-morbid mental health problems and suicidal or homicidal tendencies as well as traumatic stress that may interfere with recovery and functioning or require immediate intervention and assessment for medications. These adolescents may also need help to deal with living environments hostile to recovery and histories of violence and

victimization and in building healthy social support systems. They may also profit from more individualized treatment (Dennis, 1999).

Cluster 4

Cluster 4 members produced MMPI-A profiles revealing an impulsive, acting-out style of personality with a peak on scale 4. Validity scales of Cluster 4 MMPI-A profiles may have indicated that these adolescents were independent, responded frankly to items, and maintained a balance between self-protection and self-disclosure. Cluster 4 profiles produced no clinically significant or moderate elevations except for a moderate elevation on the scale 4 peak, suggesting a cluster of individuals who may have tended to be impulsive, hedonistic, impatient, unreliable, and assertive (Butcher et al., 1992).

Cluster 4 scored in the acute severity range on the General Mental Distress Index, possibly reflecting a great breadth and severity of internal mental distress. Learned helplessness and difficulty making decisions may have been observed since the Depressive Symptom Index fell into the high clinical severity range. Individuals comprising Cluster 4 scored in the high clinical range on the Treatment Resistance Index, signaling that these adolescents may have been at risk of dropping out of treatment early. Cluster 4 also scored in the clinical range of the Living Environment Risk Index, which could have meant that the adolescents' environments were hostile to recovery (Dennis, 1999).

Chestnut Health Systems' records indicated that 77% of Cluster 4 was diagnosed with Conduct Disorder, 42% with Attention-Deficit Hyperactivity Disorder, 8% with a

Mood Disorder, and 8% with an Anxiety Disorder. Fifteen percent of Cluster 4 came to treatment directly from jail or prison, 50% were on probation, and 12% were on parole.

In a treatment setting, clinicians may want to evaluate Cluster 4 individuals for co-morbid mental health problems, suicidal or homicidal ideation, and environments hostile to recovery (Dennis, 1999). See Table 5 for a comparison of the clinical severity of each cluster based on MMPI-A and GAIN scale scores, and refer to Table 6 for a comparison of clusters across demographic and clinical record variables. See Table 7 for the summarized results of chi-square tests of significant differences in diagnoses between the four identified clusters.

Table 5

Comparison of Clinical Severity by Cluster Across MMPI-A and GAIN Scale Scores

Severity measure	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Significant MMPI-A elevations	Moderate: L, K	None	F, 4, 6, 8, 9 Moderate: 2	Moderate: 4
MMPI-A peak scale(s)	4, 3	9, 4	4, 6, 9, 8	4
General Mental Distress Index	Clinical	Clinical	Acute	Acute
Anxiety Symptoms Index	Clinical	Clinical	Clinical	Not clinical
Traumatic Symptoms Index	Clinical	Clinical	Acute	Not clinical
Depressive Symptoms Index	Clinical	Clinical	Clinical	High clinical
Attention Deficit Disorder Symptoms Index	Clinical	Not clinical	Clinical	Not clinical
Treatment Resistance Index	Clinical	Not clinical	Not clinical	High clinical

Property Crime Index Not clinical Low clinical Not clinical Not clinical

Table 5 (continued).

Severity measure	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Personal Sources of Stress Index	Not clinical	Low clinical	Clinical	Not clinical
Living Environment Risk Index	Not clinical	Not clinical	High clinical	Clinical

Table 6

Comparison of Clusters Across Demographic and Clinical Record Variables

Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Male	68%	74%	81%	89%
Caucasian	86%	77%	62%	73%
Entered treatment from jail/prison	36%	32%	43%	15%
On probation/parole	37%	35%	29%	62%
Diagnosed with Conduct Disorder	68%	65%	86%	77%
Diagnosed with any attention deficit hyperactivity disorder	18%	29%	33%	42%
Diagnosed with Post-Traumatic Stress Disorder	23%	6%	10%	0%
Diagnosed with any mood disorder	18%	3%	19%	8%
Diagnosed with any anxiety disorder	5%	0%	10%	8%

Table 7

Chi-Square Results of Differences Approaching Significance Between Clusters on Frequency of Diagnoses

Diagnosis	<i>p</i>	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Attention deficit hyperactivity disorders	.072	4			11
Post-Traumatic Stress Disorder	.085	5	2		
Mood disorders	.066	4	1	4	
Mood disorders	.058		1	4	
Anxiety disorders	.080		0	2	
Anxiety disorders	.116		0		2
<i>n</i> = 100		22	31	21	26

Evaluation of Research Goals

One goal of this research was to cluster analyze the profiles of adolescents in residential substance abuse treatment across MMPI test versions and agency settings and to extend the results of Massey et al.'s 1992 cluster analysis. Most prior research had focused on adult male alcoholics and/or the original version of the MMPI administered to adolescents. Few cluster analysis studies had been identified which researched this population and the MMPI-A.

The second goal of this research was to explore and describe these empirically derived clusters with greater detail to provide a better picture of the complexity inherent

in adolescent substance abusers. During this exploration process, the reliability and validity of the identified clusters were evaluated, a step which has not always been described in previous works.

In this study, a cluster analysis of MMPI-A profiles was performed successfully with adolescents at admission to residential substance abuse treatment. Analyses resulted in a four cluster solution rather than the three cluster solution described by Massey et al. (1992), and the GAIN indices used to explore, describe, and validate the four clusters in greater detail did not always match the traditional descriptors derived from each cluster's average MMPI-A profile. The following sections discuss this issue more specifically by cluster and between these four clusters and the ones from the Massey et al. (1992) study. This research raised questions about the validity and reliability of the four clusters, and possible theories for these differences are described in the *Study Limitations* section.

Evaluation of Hypotheses Regarding Cluster Formation

Since both the Massey et al. (1992) study and Chestnut Health Systems' samples consisted of adolescent, mostly male, mostly Caucasian substance abusers who were administered the MMPI-A within one week of their admission to residential treatment, it was predicted that the clusters of MMPI-A profiles identified in this study would resemble the ones found by Massey et al. (1992): (a) one subgroup of clients exhibiting high levels of broad psychopathology with peaks on scales 1 and 4 and significant elevations on scales 8, 2, 3, and 7; (b) another subgroup of clients revealing an impulsive, acting-out style of personality with a peak on scale 4; and (c) a final subgroup of clients showing a lack of any clinically significant elevations. Major deviations were not

expected despite sample differences (see *Description of Sample* for specific details) since the same three clusters have been identified in several studies with different populations, most notably adult male alcoholics (Blashfield, 1985; Graham & Strenger, 1988; Morey & Blashfield, 1981; Nerviano & Gross, 1983). This hypothesis was partially confirmed.

Unlike Massey et al. (1992), this study identified four distinct clusters of adolescents rather than three, with three out of the four clusters lacking clinically significant MMPI-A scale elevations. Clusters 1 and 2, like Cluster 3 in the Massey et al. (1992) study, showed a lack of any clinically significant elevations on the MMPI-A. Cluster 3 adolescents in this study appeared to display a wider array and a greater intensity of emotional problems and distress than the other three clusters. It seemed to most closely resemble Cluster 1 in the Massey et al. (1992) study with MMPI-A profiles demonstrating broad psychopathology; however, the cluster identified by Massey et al. (1992) peaked on scale 1 as well as scale 4 and displayed clinically significant elevations on scales 2, 3, and 7. Cluster 4 members in this study appeared to resemble Cluster 2 from the Massey et al. (1992) research with MMPI-A profiles revealing an impulsive, acting-out style of personality with a peak on scale 4. In summary, this study identified the following four clusters of MMPI-A profiles: (a) the Cluster 1 profile lacking clinically significant elevations but with indications that cluster members were presenting themselves in a positive light; (b) a Cluster 2 profile lacking clinically significant elevations; (c) the Cluster 3 profile exhibiting great breadth and intensity of emotional distress with several clinically significant elevations; and (d) a Cluster 4 profile describing an impulsive, acting out personality style with a peak on scale 4 not reaching

clinical levels.

Evaluation of Cluster Validation Hypotheses

It was also predicted that mean GAIN scores on the Substance Problem Index, Substance Frequency Index, Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, Conduct Disorder Index, and the General Mental Distress Index would distinguish MMPI-A profile clusters from one another. These indices appeared to reflect the substance abuse symptoms and psychopathology which discriminated between the three common profiles described in Chapter 2. These hypotheses were partially supported.

It was found that the Treatment Motivation Index, Vocational Environmental Risk Index, Social Environmental Risk Index, Environmental Risk Index, General Victimization Index, Other Sources of Stress Index, General Social Support Index, General Crime Index, and Illegal Activity Index did not distinguish the clusters from one another. Unexpectedly, the Substance Problem Index, Substance Frequency Index, and Conduct Disorder Index failed to discriminate between clusters. The Personal Sources of Stress Index, Treatment Resistance Index, Living Environmental Risk Index, and Property Crime Index also failed to discriminate between clusters but demonstrated potential trends in the data which may have become significant with a larger sample size.

As predicted, the Depressive Symptom Index, Anxiety Symptom Index, Traumatic Stress Index, Attention Deficit Disorder Index, and the General Mental Distress Index successfully distinguished MMPI-A profile clusters from one another. In summary, the GAIN described members of the four clusters of MMPI-A profiles as

follows: (a) Cluster 1 adolescents suffered from a wide array of problems, including internal mental distress, anxiety, traumatic stress, inattention and/or hyperactivity, impulsivity, depression, and resistance to treatment. Although these problems were assessed by the GAIN as clinically significant, Cluster 1's symptoms were significantly lower than Cluster 3 in severity; (b) members of Cluster 2 also may have experienced clinically significant internal mental distress, anxiety, traumatic stress, depression, and stress from personal sources of support. Additionally, they may have been involved in a broad range of illegal activities. As with Cluster 1, Cluster 2's symptoms appeared similar to Cluster 3 but were significantly lower in severity; (c) Cluster 3 displayed a wider array and greater intensity of emotional problems than Clusters 1 and 2. They may have struggled with high levels of internal mental distress and traumatic stress, clinically significant levels of anxiety, depression, inattention and/or hyperactivity, and impulsivity. Stress from personal support systems may have been experienced, and they may have lived in environments hostile to recovery; and (d) Cluster 4 individuals also demonstrated high levels of internal mental distress of great breadth and may have suffered from depression. These individuals may have been resistant to treatment and at risk for dropping out early to return to environments somewhat hostile to recovery.

Integrated Description of Four Clusters

Unexpectedly, three out of the four clusters identified in this study lacked clinically significant MMPI-A scale elevations, while mean GAIN scale scores for the same clusters were in the clinical range. Taken together, the MMPI-A and GAIN indicate that these 100 adolescent profiles could be grouped meaningfully into the following four

clusters: (a) Cluster 1 consisted of individuals who may have presented themselves in a positive light on the MMPI-A to produce an average profile with no clinically significant elevations. According to the GAIN and in contrast to the MMPI-A, Cluster 1 adolescents may have suffered from a wide array of clinically significant mental health and behavioral problems but were significantly lower in severity than Cluster 3; (b) Cluster 2 profiles also lacked clinically significant elevations on the MMPI, but the GAIN indicated that members of Cluster 2 may have experienced clinically significant levels of mental health, behavioral, and environmental issues. Cluster 2's symptoms were significantly lower than Cluster 3's; (c) Cluster 3 exhibited the greatest breadth and intensity of emotional distress, behavioral problems, and environmental problems; and (d) Cluster 4 was described as impulsive with an acting out personality style. Cluster 4 individuals also demonstrated internal mental distress of great breadth and suffered from depression. These individuals may have been resistant to treatment and at risk of dropping out early to return to environments somewhat hostile to recovery. In summary, all clusters appeared to have problems in multiple areas of their lives. The MMPI-A and GAIN seemed to indicate that the biggest difference between clusters was related to the severity of these problems. See Table 8 for an overview of possible clinical descriptors of the four clusters.

Comparison of Four Clusters to Massey et al.'s (1992) Clusters

While differences existed between MMPI-A and GAIN clinical descriptors of the clusters from this study, there were many similarities and some differences when the integrated description was compared with the clusters identified from the Massey et al. (1992) study. Results from this study are difficult to interpret due to differences between

the samples that need to be considered when examining these results. Refer to Table 8 for a comparison of MMPI-A and GAIN clinical descriptors of the four clusters and then a comparison to the Massey et al. (1992) cluster bearing the most resemblance. The Massey et al. (1992) clusters are labeled with an “M,” for “Massey et al.,” before the cluster number to avoid confusion between the studies.

Table 8

Clinical Interpretations of Clusters Based on MMPI-A and GAIN Scale Scores

MMPI-A	GAIN	Most similar Massey et al. (1992) cluster
Cluster 1		
Presented selves in best light; minimized or denied problems; lack of insight; lack of clinically significant MMPI-A elevations	Treatment drop-out risk; history of trauma; depressed; impulsive; anxious; inattentive; hyperactive; problems lower in severity than Cluster 3	M3; lack of clinically significant MMPI-A elevations; fewer hospitalizations than M2; more education than M1; less anxious than M2; less depression, (trait, internalized, externalized) anger, alcohol dependence than M1 and M2
Cluster 2		
Responded frankly; admitted to faults; lack of clinically significant MMPI-A elevations	Part of negative peer groups; history of trauma; broad ranges of illegal activity; depressed; anxious; lower in severity than Cluster 3	M3; lack of clinically significant MMPI-A elevations; fewer hospitalizations than M2; more education than M1; less depression, anxiety, (trait, internalized, externalized) anger, alcohol dependence than M1 and M2

Table 8 (continued).

MMPI-A	GAIN	Most similar Massey et al. (1992) cluster
Cluster 3		
Responded frankly; anxious; depressed; bored with routine; poor self-concept; creative; angry; impulsive; inattentive; sensitive to rejection; suspicious; perfectionistic; manipulative	Living environment hostile to recovery; high levels traumatic stress; suicidal; great breadth, severity of mental distress; inattentive; hyperactive; impulsive; more severe than Clusters 1 and 2	M1; broad psychopathology; less education than M2 and M3; more depressed, more anxious than M2 and M3; more (trait, internalized, externalized) anger, alcohol dependency than M3
Cluster 4		
Responded frankly; admitted to faults; impulsive; acting out; impatient	Living environment hostile to recovery; treatment drop-out risk; suicidal; great breadth, severity of mental distress; depressed	M2; more hospitalizations than M3; less depressed, anxious than M1; more depressed, anxious than M3; more (trait, internalized, and externalized) anger, alcohol dependence than M3

Study Limitations

Results of this research should be interpreted with several limitations in mind. Importantly, the sample of adolescents comprising the clusters in this research was small, which affected the power of the analyses and may have rendered some statistical findings deceptively large or small in comparison to other clusters. Additionally, some similar trends in demographic and clinical characteristics with the Massey et al. (1992) sample were noted, yet the two samples were different enough to warrant caution when

interpreting the results of this research as an extension of the Massey et al. (1992) study. Chestnut Health Systems' adolescents consisted of slightly higher rates of males (76% vs. 66%), lower rates of Caucasians (75% vs. 93%), and slightly older adolescents with higher rates of marijuana abuse and dependence (89% vs. 69%) and of alcohol abuse or dependence (78% vs. 18%). This sample's members could have been further along in their "treatment careers." These differences may have affected the cluster solution and validation variables.

Unexpectedly, three out of the four clusters identified in this study lacked clinically significant MMPI-A scale elevations, while mean GAIN scale scores for the same clusters were in the clinical range. One cluster in this study appeared to be minimizing symptoms on the MMPI-A, which would explain a lack of significant profile elevations, but the GAIN still identified serious symptoms and problems in these adolescents' lives. Reasons for this difference are unclear. These adolescents represent a severely impaired clinical population which would presumably produce more significant scale elevations, as they did in the Massey et al. (1992) study. The two instruments were administered close to the residential treatment admission date, within one week of each other the majority of the time, which can be a time when adolescents are "coming off" of drugs, leaving a chaotic environment, or dealing with attention and concentration problems. This tumultuous time may have affected how they interpreted and responded to different items despite the cognitive impairment test conducted at the beginning of every GAIN to help control for these issues. Both instruments do rely on self-report, and the GAIN's items are more face valid, so some adolescents may have either exaggerated

or minimized their answers to project an intended level of drug abuse severity.

A small sample of GAINs were partially administered by clinical staff before the adolescent's admission to treatment. The adolescents in that situation could not be assured that their information would not go to certain sources, such as probation or school, and also may have either exaggerated or minimized their answers to project an intended level of drug abuse severity in this situation. In these cases, the GAIN was reviewed by research staff with the client as the administration was finished after admission.

A second unexpected finding was the identification of four clusters in this study while Massey et al. (1992) and other studies identified only three (Blashfield, 1985; Graham & Strenger, 1988; Morey & Blashfield, 1981; Nerviano & Gross, 1983). One cluster in this study appeared to be minimizing symptoms and, therefore, may resemble other clusters if they responded frankly. The fourth cluster may be the product of the method of cluster analysis. There is no concrete method or criteria for selecting the number of clusters in the final solution, which can limit generalizability.

Summary

For this study, a cluster analysis of MMPI-A profiles was performed successfully with adolescents in residential substance abuse treatment. Analyses resulted in an empirically derived four cluster solution rather than the three cluster solution described by Massey et al. (1992), and the GAIN indices used to explore, describe, and validate the four clusters in greater detail did not always match the traditional descriptors derived from each cluster's average MMPI-A profile.

Taken together, the MMPI-A and GAIN indicate that these 100 adolescent profiles could be grouped meaningfully into the following four clusters: (a) Cluster 1 consisted of individuals who may have presented themselves in a positive light on the MMPI-A to produce an average profile with no clinically significant elevations. According to the GAIN and in contrast to the MMPI-A, Cluster 1 adolescents may have suffered from a wide array of clinically significant mental health and behavioral problems but were significantly lower in severity than Cluster 3; (b) Cluster 2 profiles also lacked clinically significant elevations on the MMPI, but the GAIN indicated that members of Cluster 2 may have experienced clinically significant levels of mental health, behavioral, and environmental issues. Cluster 2's symptoms were significantly lower than Cluster 3's; (c) Cluster 3 exhibited the greatest breadth and intensity of emotional distress, behavioral problems, and environmental problems; and (d) Cluster 4 was described as impulsive with an acting out personality style. Cluster 4 individuals also demonstrated internal mental distress of great breadth and suffered from depression. These individuals may have been resistant to treatment and at risk of dropping out early to return to environments somewhat hostile to recovery. In summary, all clusters appeared to have problems in multiple areas of their lives. The MMPI-A and GAIN seemed to indicate that the biggest difference between clusters was related to the severity of these problems.

This research raises questions about the validity and reliability of the four clusters and whether or not this study is a true extension of Massey et al.'s 1992 work. Theories for these differences are described in the *Study Limitations* section. These limitations reinforce why it is necessary to integrate MMPI-A and GAIN information with other test

results, clinical interviews, family assessment, and a psychosocial history for diagnostic and treatment planning recommendations.

Suggestions for Further Research

Further research is warranted to address the above study limitations. Studies including larger and more closely matched samples of adolescents should be conducted to increase the power of the analyses and to further test the validity and reliability of identified clusters. Since cluster profiles in this study lacked clinically significant MMPI-A scale elevations while they displayed mean GAIN scale scores in the clinical range, more research using the MMPI-A with this population is needed. It is unclear if the GAIN is a more sensitive clinical instrument, the MMPI-A is not sensitive enough with this clinical population, or if the two measures are tapping into different constructs. Testing for cognitive impairment should be an integral part of this research since admission to residential substance abuse treatment is often a tumultuous time when adolescents may exaggerate or minimize their answers to project an intended level of drug abuse severity, suffer withdrawal symptoms, and have concentration problems.

Future studies are also needed to focus on the development of concrete methods or criteria for selecting the number of clusters in the final solution of a cluster analysis to enhance generalizability. Such empirically derived clusters would provide a better picture of the complexity inherent in adolescent substance abusers in particular since more research is needed with this population and the MMPI-A.

Investigation into the predictive utility of identified clusters may be another avenue for future research to produce invaluable clinical information to help clinicians

intervene early and appropriately to problems of adolescents admitted into residential substance abuse treatment. Lastly, future research is needed regarding empirical validation of the interpretations of adolescent codetypes.

REFERENCES

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- American Society of Addiction Medicine. (1996). *Patient placement criteria for the*

treatment of psychoactive substance disorders (2nd ed.). Chevy Chase, MD:
Author.

Archer, R. P. (1984). Use of the MMPI with adolescents: A review of salient issues. *Clinical Psychology Review, 4*, 241-251.

Archer, R. P. (1994). The Minnesota Multiphasic Inventory–Adolescent. In M. Maruish (Ed.), *Use of psychological testing for treatment planning and outcome assessment* (pp. 423-452). Hillsdale, NJ: Erlbaum.

Archer, R. P. (1997a). Future directions for the MMPI-A: Research and clinical issues. *Journal of Personality Assessment, 68*, 95-109.

Archer, R. P. (1997b). *MMPI-A: Assessing adolescent psychopathology* (2nd ed.). Mahwah, NJ: Erlbaum.

Archer, R. P., Gordon, R. A., Giannetti, R. A., & Singles, J. M. (1988). MMPI scale clinical correlates for adolescent inpatients. *Journal of Personality Assessment, 52*, 707-721.

Archer, R. P., Maruish, M., Imhof, E. A., & Piotrowski, C. (1991). Psychological test usage with adolescent clients: 1990 survey findings. *Professional Psychology: Research and Practice, 22*, 247-252.

Babor, T. F., Del Boca, F. K., McLaney, M. A., Jacobi, B., Higgins-Biddle, J., & Hass, W. (1991). Just say Y.E.S.: Matching adolescents to appropriate interventions for alcohol and other drug related problems. *Alcohol Health and Research World, 15*, 77-86.

Babor, T. F., Dolinsky, Z. S., Meyer, R. E., Hesselbrock, M., Hofmann, M., & Tennen, H.

- (1992a). Types of alcoholics: Concurrent and predictive validity of some common classification schemes. *British Journal of Addiction*, *87*, 1415-1431.
- Babor, T. F., Hofmann, M., Del Boca, F. K., Hesselbrock, V., Meyer, R. E., Dolinsky, Z. S., & Rounsaville, B. (1992b). Types of alcoholics, I: Evidence for an empirically derived typology based on indicators of vulnerability and severity. *Archives of General Psychiatry*, *49*, 599-608.
- Barnes, G. M. (1984). Adolescent alcohol abuse and other problem behaviors: Their relationships and common parental influences. *Journal of Youth and Adolescence*, *13*, 329-348.
- Blashfield, R. K. (1985). Meta-cluster-analysis on MMPI studies of alcoholics. *Bulletin of the Society of Psychologists in Addictive Behaviors*, *4*, 29-40.
- Borgen, F. H., & Barnett, D. C. (1987). Applying cluster analysis in counseling psychology research. *Journal of Counseling Psychology*, *34*, 456-468.
- Brook, J. S., Whiteman, M., & Gordon, A. S. (1983). Stages of drug use in adolescence: Personality, peer, and family correlates. *Developmental Psychology*, *19*, 269-277.
- Buchan, B. J., Tims, F., & Dennis, M. L. (2000). Consistency and validity of marijuana use measured by self-report, collateral reports, on-site testing and laboratory testing [Abstract]. *Journal of Drug and Alcohol Dependence*, *60* (Suppl. 1), 26.
- Bukstein, O. G., Brent, D. A., & Kaminer, Y. (1989). Comorbidity of substance abuse and other psychiatric disorders in adolescents. *American Journal of Psychiatry*, *146*, 1131-1141.
- Bukstein, O., & Kaminer, Y. (1994). The nosology of adolescent substance abuse.

American Journal on Addictions, 3, 1-13.

Butcher, J. N., Dahlstrom, W. G., Graham, J. R., Tellegen, A., & Kaminer, B. (1989).

Minnesota Multiphasic Personality Inventory-2 (MMPI-2): Manual for administration and scoring. Minneapolis: University of Minnesota Press.

Butcher, J. N., Graham, J. R., & Ben-Porath, Y. S. (1995). Methodological problems and issues in MMPI, MMPI-2 and MMPI-A research. *Psychological Assessment*, 7, 320-329.

Butcher, J. N., & Pope, K. S. (1992). The research base, psychometric properties, and clinical uses of the MMPI-2 and MMPI-A. *Canadian Psychology*, 33, 61-78.

Butcher, J. N., Williams, C. L., Graham, J. R., Archer, R. P., Tellegen, A., Ben-Porath, Y. S., & Kaemmer, B. (1992). *MMPI-A (Minnesota Multiphasic Personality Inventory-Adolescent): Manual for administration, scoring, and interpretation*. Minneapolis: University of Minnesota Press.

Chestnut Health Systems: Statistics on adolescent residential treatment admissions [Electronic database]. (2000). Bloomington, IL: Chestnut Health Systems [Producer and Distributor].

Clark, D. B., Jacob, R. G., & Mezzich, A. C. (1994). Anxiety and conduct disorders in early onset alcoholism. *Annals of the New York Academy of Sciences*, 708, 181-186.

Colligan, R. C., & Offord, K. P. (1989). The aging MMPI: Contemporary norms for contemporary teenagers. *Mayo Clinic Proceedings*, 64, 3-27.

Conley, J. J. (1981). An MMPI typology of male alcoholics: Admission, discharge, and

- outcome comparisons. *Journal of Personality Assessment*, 45, 33-39.
- DeMilio, I. (1989). Psychiatric syndromes in adolescent substance abusers. *American Journal of Psychiatry*, 146, 1212-1214.
- Dennis, M. L. (1991). *Global Appraisal of Individual Needs (GAIN)*. Bloomington, IL: Lighthouse Institute, Chestnut Health Systems.
- Dennis, M. L. (1999). *Global Appraisal of Individual Needs (GAIN): Administration guide for the GAIN and related measures*. Bloomington, IL: Chestnut Health Systems.
- Dennis, M. L., Babor, T. F., Diamond, G., Donaldson, J., Godley, S. H., Tims, F., Titus, J. C., Webb, C., & Herrell, J. (2000). *The Cannabis Youth Treatment (CYT) experiment: Preliminary findings*. Rockville, MD: Center for Substance Abuse Treatment.
- Dennis, M. L., Funk, R., Godley, S. H., Godley, M. D., & Waldron, H. (2001). *Measuring peak alcohol use among adolescents entering residential treatment: A cross validation of estimates from the GAIN-I and Form 90 Timeline Followback methods*. Manuscript submitted for publication.
- Dennis, M. L., Godley, S. H., & Titus, J. (1999). *Co-occurring psychological distress and behavior problems among adolescents: Variations by treatment, level of care, and gender* (TIE Communique). Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Dennis, M. L., Noursi, S. D., & Muck, R. (in press). The need for developing and evaluating adolescent treatment models. In S. J. Stevens & A. R. Morral (Eds.),

Adolescent drug treatment: Theory and implementation in ten national projects.

Binghamton, NY: Haworth.

Dennis, M. L., Scott, C. K., Godley, M. D., & Funk, R. (1999). *Comparisons of adolescents and adults by ASAM profile using GAIN data from the Drug Outcome Monitoring Study (DOMS): Preliminary data tables.* Bloomington, IL: Chestnut Health Systems.

Dennis, M. L., & Titus, J. C. (2000, August). *Patterns of adolescent substance dependence, abuse, and use.* Paper presented at the annual convention of the American Psychological Association, Washington, DC.

Department of Alcoholism and Substance Abuse. (1995). *1995 Illinois Youth Survey on Substance Use: Executive summary.* Chicago: Author

Dielman, T. E., Butchart, A. T., Shope, J. T., & Miller, M. (1991). Environmental correlates of adolescent substance use and misuse: Implications for prevention programs. *International Journal of the Addictions, 25*, 855-880.

Donovan, J. E., Jessor, R., & Costa, F. M. (1988). Syndrome of problem behavior in adolescence: A replication. *Journal of Consulting and Clinical Psychology, 56*, 762-765.

Ehrenworth, N. V., & Archer, R. P. (1985). A comparison of clinical accuracy ratings of interpretive approaches for adolescent MMPI responses. *Journal of Personality Assessment, 49*, 413-421.

- Farrell, A. D., Danish, S. J., & Howard, C. W. (1992). Relationship between drug use and other problem behaviors in urban adolescents. *Journal of Consulting and Clinical Psychology, 60*, 705-712.
- Finney, J. W., & Moos, R. H. (1986). Matching patients with treatments: Conceptual and methodological issues. *Journal of Studies on Alcohol, 47*, 122-134.
- Galluci, N. T. (1994). Criteria associated with clinical scales and Harris-Lingoes subscales of the Minnesota Multiphasic Personality Inventory with adolescent inpatients. *Psychological Assessment, 6*, 179-187.
- Galluci, N. T. (1997). On the identification of patterns of substance abuse with the MMPI-A scales. *Psychological Assessment, 9*, 224-232.
- Godley, M. D., Godley, S. H., Dennis, M. L., Funk, R., & Passetti, L. L. (in press). A randomized field trial of an assertive continuing care protocol for adolescents discharged from residential treatment: Preliminary outcomes. *Journal of Substance Abuse Treatment*.
- Graham, J. R., & Strenger, V. E. (1988). MMPI characteristics of alcoholics: A review. *Journal of Consulting and Clinical Psychology, 56*, 197-205.
- Hammersly, R., Lavelle, T. L., & Forsyth, A. J. (1992). Adolescent drug use, health, and personality. *Drug and Alcohol Dependence, 31*, 91-99.
- Hathaway, S. R., & Monachesi, E. D. (1963). *Adolescent personality and behavior: MMPI patterns of normal, delinquent, dropout, and other outcomes*. Minneapolis: University of Minnesota Press.

- Hobfoll, S. E., & Segal, B. (1983). A factor analytic study of the relationship of experience seeking and trait anxiety to drug use and reasons for drug use. *International Journal of the Addictions, 18*, 539-549.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2000). *Monitoring the Future National Survey results on drug use, 1975-1999. Volume 1: Secondary school students*. Rockville, MD: National Institute on Drug Abuse.
- Kadden, R. M., Cooney, N. L., Getter, H., & Litt, M. D. (1989). Matching alcoholics to coping skills or interactional therapies: Post-treatment results. *Journal of Consulting and Clinical Psychology, 57*, 698-704.
- Katzman, R., Brown, T., Fuld, P., Peck, A., Schechter, R., & Schimmel, H. (1983). Validation of short orientation-memory-concentration test of cognitive impairment. *American Journal of Psychiatry, 140*, 734-739.
- Kline, R. B., & Snyder, D. K. (1984). Alcoholic MMPI subtypes. *Journal of Consulting and Clinical Psychology, 53*, 70-79.
- Komro, K. A., Williams, C. L., Forster, J. L., Perry, C. L., Farbakhsh, K., & Stigler, M. H. (1999). The relationship between adolescent alcohol use and delinquent and violent behaviors. *Journal of Child and Adolescent Substance Abuse, 9*, 13-28.
- Labouvie, E. W., & McGee, C. R. (1986). Relation of personality to alcohol and drug use in adolescence. *Journal of Consulting and Clinical Psychology, 54*, 289-293.
- Lachar, D., Klinge, V., & Grisell, J. L. (1976). Relative accuracy of automated MMPI narratives generated from adult norm and adolescent norm profiles. *Journal of Consulting and Clinical Psychology, 44*, 20-24.

- Leccese, M., & Waldron, H. B. (1994). Assessing adolescent substance use: A critique of current measurement instruments. *Journal of Substance Abuse Treatment, 11*, 553-563.
- Litt, M. D., Babor, T. F., Del Boca, F. K., Kadden, R. M., & Cooney, N. L. (1992). Types of alcoholics II: Application of an empirically derived typology to treatment matching. *Archives of General Psychiatry, 49*, 609-614.
- Marks, P. A., Seeman, W., & Haller, D. L. (1974). *The actuarial use of the MMPI with adolescents and adults*. Baltimore: Williams and Wilkins.
- Martin, C. S., Kaczynski, N. A., Maisto, S. A., Bukstein, O. M., & Moss, H. B. (1995). Patterns of DSM-IV alcohol abuse and dependence symptoms in adolescent drinkers. *Journal of Studies on Alcohol, 56*, 672-680.
- Massey, R. F., Walfish, S., & Krone, A. (1992). Cluster analysis of MMPI profiles of adolescents in treatment for substance abuse. *Journal of Adolescent Chemical Dependency, 2*, 23-33.
- McLellan, A. T., Woody, G. E., Luborsky, L., O'Brien, C. P., & Druley, K. A. (1983). Increased effectiveness of substance abuse treatment: A prospective study of patient-treatment "matching." *Journal of Nervous and Mental Disease, 171*, 597-605.
- Miller, W. R. (1996). *Form 90: A structured assessment interview for drinking and related behaviors* (NIH Publication No. 96-4004, NIAAA Research Monograph Series). Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

- Miller, W. R., & Del Boca, F. K. (1994). Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol* (Suppl. 2), 112-118.
- Morey, L. C., & Blashfield, R. K. (1981). Empirical classifications of alcoholism. *Journal of Studies on Alcohol*, 42, 925-937.
- Morey, L. C., Skinner, H. A., & Blashfield, R. K. (1984). A typology of alcohol abusers: Correlates and implications. *Journal of Abnormal Psychology*, 93, 408-417.
- Moss, H. B., & Kirisci, L. (1995). Aggressivity in adolescent alcohol abusers: Relationship with conduct disorder. *Alcoholism: Clinical and Experimental Research*, 19, 642-646.
- Neighbors, B., Kempton, T., & Forehand, R. (1992). Co-occurrence of substance abuse with conduct, anxiety, and depression disorders in juvenile delinquents. *Addictive Behaviors*, 17, 379-386.
- Nerviano, V. J., & Gross, H. W. (1983). Personality types of alcoholics on objective inventories. *Journal of Studies on Alcohol*, 44, 837-851. Office of Applied Studies. (1996). *National Household Survey on Drug Abuse: Main findings* (DHHS Publication No. SMA 96-3085). Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Owen, P. L., & Nyberg, L. R. (1983). Assessing alcohol and drug problems among adolescents: Current practices. *Journal of Drug Education*, 13, 249-254.
- Pancoast, D. L., & Archer, R. P. (1988). MMPI adolescent norms: Patterns and trends across four decades. *Journal of Personality Assessment*, 52, 691-706.

- Pfost, K. S., Kunce, J. T., & Stevens, M. J. (1984). The relationship of MacAndrew alcoholism scale scores to MMPI profile type and degree of elevation. *Journal of Clinical Psychology, 40*, 852-855.
- Project MATCH Research Group. (1993). Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. *Alcoholism: Clinical and Experimental Research, 17*, 1130-1145.
- Public Health Service. (1993). *Code of Federal Regulations: Part 2*. Washington DC: Author.
- Rapkin, B. D., & Luke, D. A. (1993). Cluster analysis in community research: Epistemology and practice. *American Journal of Community Psychology, 21*, 247-277.
- Risberg, R. A., Stevens, M. J., & Graybill, D. F. (1995). Validating the adolescent form of the Substance Abuse Subtle Screening Inventory. *Journal of Child and Adolescent Substance Abuse, 4*, 25-41.
- Rohsenow, D. J., Monti, P. M., Binkoff, J. A., Liepman, M. R., Nirenberg, T. D., & Abrams, D. B. (1991). Patient-treatment matching for alcoholic men in communication skills versus cognitive-behavioral mood management training. *Addictive Behaviors, 16*, 63-69.
- Schuckit, M. (1985). The clinical implications of primary diagnostic groups among alcoholics. *Archives of General Psychiatry, 42*, 1043-1049.
- Shedler, J., & Block, J. (1990). Adolescent drug use and psychological health: A longitudinal inquiry. *American Psychologist, 45*, 612-630.

- Stevens, S. J., & Morral, A. R. (Eds.). (in press). *Adolescent drug treatment: Theory and implementation in ten national projects*. Binghamton, NY: Haworth.
- Substance Abuse and Mental Health Services Administration. (1997). *Preliminary results from the 1996 National Household Survey on Drug Abuse*. Rockville, MD: Author.
- Substance Abuse and Mental Health Services Administration. (2001). *CASA National Survey of American Attitudes on Substance Abuse VI: Teens*. Rockville, MD: Author.
- Tarter, R. E., Kirisci, L., Hegedus, A. M., Mezzich, A. C., & Vanyukov, M. (1994). Heterogeneity of adolescent alcoholism. *Annals of the New York Academy of Sciences*, 708, 172-180.
- Williams, C. L., Ben-Porath, Y. S., & Hevern, B. W. (1994). Item level improvements for use of the MMPI with adolescents. *Journal of Personality Assessment*, 63, 284-293.
- Williams, C. L., & Butcher, J. N. (1989). An MMPI study of adolescents: I. Empirical validity of standard scales. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 1, 251-259.
- Windle, M. (1996). An alcohol involvement typology for adolescents: Convergent validity and longitudinal stability. *Journal of Studies on Alcohol*, 57, 627-637.
- Winters, K. C. (1990a). Clinical considerations in the assessment of adolescent chemical dependency. *Journal of Adolescent Chemical Dependence*, 1, 31-52.

- Winters, K. C. (1990b). The need for improved assessment of adolescent substance involvement. *Journal of Drug Issues, 20*, 487-502.
- Winters, K. C., Stinchfield, R. D., Fulkerson, J., & Henly, G. A. (1993). Measuring alcohol and cannabis use disorders in an adolescent clinical sample. *Psychology of Addictive Behaviors, 7*, 185-196.
- Zuckerman, M. (1972). Drug usage as one manifestation of a sensation-seeking trait. In W. Keup (Ed.), *Drug abuse, current concepts, and research* (pp. 154-163). Springfield, IL: Thomas.